NBSIR 79-1612

ISOBUTANE: PROVISIONAL THERMODYNAMIC FUNCTIONS FROM 114 TO 700 K AT PRESSURES TO 700 BAR

Robert D. Goodwin

Thermophysical Properties Division
National Engineering Laboratory
National Bureau of Standards
Boulder, Colorado 80303

NBSIR 79-1612

ISOBUTANE: PROVISIONAL THERMODYNAMIC FUNCTIONS FROM 114 TO 700 K AT PRESSURES TO 700 BAR

Robert D. Goodwin

Thermophysical Properties Division
National Engineering Laboratory
National Bureau of Standards
Boulder, Colorado 80303

July 1979

U.S. DEPARTMENT OF COMMERCE, Juanita M. Kreps, Secretary

Sidney Harman, Under Secretary
Jordan J. Baruch, Assistant Secretary for Science and Technology

NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ISOBUTANE: PROVISIONAL THERMODYNAMIC FUNCTIONS
FROM 114 to 700 K AT PRESSURES TO 700 BAR

Robert D. Goodwin

.

Thermophysical properties of isobutane are tabulated at integral temperatures along isobars over the entire range of fluid states. Results for the compressed liquid, from the triple- to the boiling-point, have been estimated by use of the highly constrained, nonanalytic equation of state, because experimental P-ρ-T data are lacking in this region.

Key words: Densities; enthalpies; entropies; equation of state; internal energies; isobars; isobutane; isochores; isotherms; Joule-Thomson inversion; latent heats of vaporization; melting line; orthobaric densities; specific heats; speeds of sound; vapor pressures.

1. INTRODUCTION

Isobutane not only is a component of liquefied natural gas (LNG), but also may become an important heat-exchange fluid for geothermal cycles [37]. The present report is fifth in a series on the pure component of LNG, namely methane, ethane, propane, n-butane, and isobutane.

Earlier compendia on isobutane have been presented by Das, et al. [12], and by Starling, et al. [37]. Functions for ideal gas states recently were computed from spectroscopic data by Chen, et al. [6]. A survey of available data quite recently has been prepared by Kestin, et al. [25], and thermodynamic properties have been tabulated by Milora and Combs [28a]. Our objective in this report is to provide additional background and provisional derived properties on isobutane. At present, serious deficiencies exist in accurate experimental P-ρ-T data for the single phase, and for the coexistence boundary: vapor-pressures; orthobaric densities; and heats of vaporization.

Whereas no P-ρ-T compressibility data exist for compressed liquid isobutane at temperatures roughly below 300 K, there are accurate data for the saturated liquid densities. By use of these data in the present, highly constrained equation of state, we have estimated thermophysical properties for the compressed liquid at low temperatures. Also presented here are formulations of the vapor pressures, the orthobaric densities, the virial equation, the equation of state, the ideal gas thermofunctions, the heats of vaporization, specific heats for the saturated liquid, thermophysical properties on the liquid-vapor coexistence boundary from the triple- to the critical-point, and thermophysical properties at integral temperatures along isobars from 0.1 through 700 bar.

To validate present work, some comparisons are made with results of Sage and Lacey [34], of Das, et al. [12], and of Starling, et al. [37].

2. PHYSICAL PROPERTIES

Symbols and units appear in Appendix A. The density-temperatures diagram of isobutane is presented by fig. 1. The upper, left corner gives the freezing liquid line.

2.1 Fixed-Point Values

These values are listed in Appendix B.

(a) The Triple Point. The temperature is adopted from Das, et al. [12]. The pressure is obtained from our vapor-pressure eq. (2). The liquid density is assigned for consistency with data in eq. (3). The vapor density is obtained from our saturated-vapor densities eq. (4).

(b) The Boiling Point. The temperature is from our vapor-pressure eq. (2) at a pressure of 1 atm = 1.01325 bar. Liquid and vapor densities are from eqs. (3) and (4).

(c) The Critical Point. The temperature of 408.0 K is adopted in present work on the basis of fitting orthobaric densities, P-ρ-T data, and examining behavior of the calculated critical isotherm. Beattie, et al. [2] derived the experimental value 134.98 $\pm$ 0.05°C (Int.). The present critical density of 3.86 mol/L is adopted on the same basis as T_c, above. Beattie, et al. found 3.80 $\pm$ 2 percent mol/L. The critical pressure from our vapor-pressure eq. (2) is 36.549 bar, as compared with 36.477 $\pm$ 0.05 bar found by Beattie, et al.

2.2 Melting Line and Vapor Pressures

(a) The Melting Line. Measurements were described by Reeves, Scott, and Babb [32]. We are grateful for a private communication from Professor Stanley E. Babb, Jr., October 2, 1978, giving these, lower-pressure data for isobutane,

T, K	P, bar
140.6	°1140
160.3	3047
164.7	3720

By graphical approximations (for T_t = 113.55 K), we have estimated the constants P_0 = 430 bar, and ϵ = 6.08 for the Simon equation,

$$P = P_t + P_o [(T/T_t)^{\epsilon} - 1], \tag{1}$$

These constants differ greatly from those for other substances, e.g.,

	P_o, bar	ϵ
Methane	1909	1.85
Ethane	2560	2.179
Propane	7180	1.283
n-butane	3634	2.210
Isobutane	ˉ430	6.08

(b) The Vapor Pressures. Data used for adjusting eq. (2) appear in

table 1. Values at ID = 40 have been derived via thermal loops, as described in [17], by use of the saturated liquid specific heat data of Aston [1] from the triple- to the boiling-point; the heat of vaporization at the normal boiling point [1]; the ideal gas thermofunctions formulated here in section 2.6; the virial equation formulated here in section 2.4; and, for the minor contribution of V·dP to ΔH on the saturated liquid path, we also used preliminary vapor-pressure and saturated liquid densities equations. Equation (2) is similar to previous forms [17,18,19].

The arguments for eq. (2) are

$$x(T) \equiv T/T_c, \qquad u(T) \equiv (1 - 1/x),$$

$$\ln(P) = a + b \cdot u + c \cdot x + d \cdot x^2 + e \cdot x^3 + f \cdot x \cdot (1 - x)^\epsilon , \qquad (2)$$

where P is in bar, ϵ = 1.95, and -

a	=	13.8083 5297	d = 112.7583 3458	
b	=	9.3726 9200	e = - 52.4214 0768	
c	=	-70.5466 3008	f = 47.8112 2198	

Exponent ϵ was selected for a best "fit" of P-ρ-T data under the constraint that, at the critical point, the slope of the critical isochore, from the equation of state, be equal to the slope of the vapor-pressure equation, $\partial P/\partial T = dP_\sigma/dT$. The fit of present vapor-pressure data is totally insensitive to values

$1.1 \leq \epsilon \leq 1.95$, but the critical-point slope is dependent on the value of ϵ. The present slope at the critical point is $dP_\sigma/dT = 0.6341$ bar/K.

The last column of table 1 gives the experimental difference,

$$\ln(P/P_t)/\ln(P_c/P_t) - (1 - T_t/T)/(1 - T_t/T_c) \quad,$$

which would be zero for the elementary vapor-pressure equation, $\ln(P) = a - b/T$, when a and b are eliminated by constraint to the end-points.

2.3   The Orthobaric Densities

(a) Saturated Liquid Densities. Data in table 2 have been selected for consistency. The variables for eq. (3) are -

$$x(T) \equiv (T_c - T)/(T_c - T_t), \quad y(\rho) \equiv (\rho - \rho_c)/(\rho_t - \rho_c) \quad,$$

$$\tag{3}$$

$$y = x + (x^\epsilon - x)\cdot[a + b\cdot x^2 + c\cdot x^3] \quad,$$

where $\epsilon = 0.35$, and

$$a = 0.7869\ 1345 \qquad\qquad c = 0.0576\ 9816$$
$$b = -0.1427\ 5354$$

The experimental residual in the last column of table 2 is -

$$(y - x)/(x^\epsilon - x) \quad.$$

A plot of this residual shows the form of polynomial needed for (3).

(b) Saturated Vapor Densities. The following new type of formulation for saturated vapor densities has been developed for consistency with the equation of state (6), below, to yield a compressibility factor approaching unity in the limit of low densities, as described earlier [17a,18]. Data in table 3 have been selected for consistency. Values at ID = 40 are derived from our vapor-pressure and virial equations. We formulate the compressibility-factor for saturated vapor, by use of our vapor-pressure equation, such that $Z_\sigma(T)$ approaches unity as $\rho \rightarrow 0$, (hence $T_\sigma(\rho) \rightarrow 0$). Subscripts are omitted because we refer always to saturated vapor and to the vapor pressure. Let $A_0 \equiv (Z_c - 1)$ where Z_c is

value of the compressibility-factor at the critical point, and define the arguments

$$\pi(T) \equiv P_\sigma(T)/P_c, \quad x(T) \equiv T/T_c, \quad u(T) \equiv (1 - x) .$$

The saturated vapor densities, $d_g \equiv P/(Z \cdot R \cdot T)$, then are given by

$$Z = 1 + A_0 \cdot \pi \cdot x^{-2} \cdot f(x) , \tag{4}$$

$$f(x) \equiv 1 + a \cdot u^\epsilon + b \cdot u + c \cdot \exp[\eta \cdot (1 - 1/u)] ,$$

where $\epsilon = 0.35$, $\eta = 3.6$, and

$$a = -0.7640\ 5184 \qquad\qquad c = 30.7506\ 6326$$
$$b = 0.6505\ 0118$$

The next-to-last column in table 3 gives the experimental values

$$F(Z) \equiv (Z_{exp} - 1) \cdot x^2/[A_0 \cdot \pi] ,$$

used to develop a functional form for $f(x)$.

2.4 The Virial Equation

For the truncated virial equation,

$$Pv/RT = 1 + B^*(x) \cdot \rho + \ldots \tag{5a}$$

we use reduced variables, $\rho \equiv d/d_c$, $x \equiv T/T_c$, where, for (5b) only, $d_c = 3.80$ mol/L and $T_c = 408.13$ K,

$$B^*(x) = B_1 + B_2/x + B_3/x^3 , \tag{5b}$$

5

$$B_1 = 0.500\ 8472 \qquad\qquad B_3 = -0.647\ 8123$$
$$B_2 = -1.100\ 3932$$

The first part of table 4 gives data used for adjusting (5b). Excluded data weighted zero appear at the end of table 4.

2.5 The Equation of State

Figure 2 shows the P-T regions covered by P-ρ-T data of Beattie, et al. (1950) [3]; of Morris, et al. (1939), [29]; and of Sage and Lacey (1938), [34]. The data of Sage and Lacey were omitted from least-squares fitting because they are superseded by Morris.

The nonanalytic equation of state used here has only three least-squares coefficients for each isochore, as described in detail elsewhere [18]. Because it is constrained to the liquid-vapor coexistence boundary, we have extrapolated the equation to cover the entire compressed liquid region down to the triple-point temperature (114 K): compare fig. 1.

For any density (isochore) the coexistence temperature, $T_\sigma(\rho)$, is obtained by iteration from equations for the orthobaric densities. The vapor pressure, $P_\sigma[T_\sigma(\rho)]$ thus is a function of density, and the equation of state has the form

$$P - P_\sigma(\rho) = \rho R^* \cdot [T - T_\sigma(\rho)] + \rho^2 R^* T_c \cdot F(\rho,T) \quad , \tag{6}$$

$$F(\rho,T) \equiv B(\rho) \cdot \phi(\rho,T) + C(\rho) \cdot \Psi(\rho,T) \quad . \tag{6a}$$

The temperature-dependent functions in (6a) are

$$\phi(\rho,T) \equiv x^{1/2} \cdot \ln\,[T/T_\sigma(\rho)] \quad , \tag{6b}$$

$$\Psi(\rho,T) \equiv \psi(\rho,T) - \psi_\sigma(\rho) \quad , \tag{6c}$$

where $\psi_\sigma(\rho)$ is obtained from $\psi(\rho,T)$ merely by replacing T with $T_\sigma(\rho)$,

$$\psi(\rho,T) \equiv \delta \cdot \exp[\varepsilon \cdot (1-x)] + (1-\delta) \cdot [1-\omega + \omega \cdot \ln(\omega)] \quad . \tag{6d}$$

The parameter, $0 \leq \delta \leq 1$, in (6d) is for relative weighting of the analytic and nonanalytic parts, and

$$\omega(\rho,T) \equiv [1 - \theta(\rho)/T] \quad , \tag{6e}$$

where $\theta(\rho)$ is a locus of temperatures inside the coexistence envelope

$$\theta(\rho) \equiv T_\sigma(\rho) \cdot \exp[-\alpha \cdot f(\rho)] \quad , \tag{6f}$$

$$f(\rho) \equiv |\rho - 1|^3 / (\rho_t - 1)^3 \quad ,$$

and ρ_t is reduced density at the liquid triple point.

The density-dependent coefficients in (6a) are

$$B(\rho) \equiv B_1 + B_2 \cdot \exp(\beta \cdot \rho) \quad , \tag{6g}$$

$$C(\rho) \equiv C_1 \cdot (\rho - 1) \cdot \exp[-\gamma \cdot \rho^4] \quad . \tag{6h}$$

Parameters and coefficients of (6) for isobutane are

$\alpha = 1, \quad \beta = 0.5, \quad \gamma = 0.3, \quad \delta = 2/3, \quad \varepsilon = 3,$

$B_1 = -0.0516\ 5511\ 088 \qquad\qquad C_1 = 0.4208\ 3144\ 154$

$B_2 = 0.6231\ 5236\ 106$

Table 5 gives behavior of coefficients $B(\rho)$, $C(\rho)$ as a function of density, and Table 6 gives behavior along the critical isotherm. These tables show that the equation is smooth and well-behaved. Table 7 summarizes data and deviations of the three authors, and table 8 gives deviations for each of the 246 P-ρ-T data used. Whereas the deviations in general are greater than for methane, ethane, propane, or n-butane, we nevertheless have a smooth and consistent representation by means of the present, highly-constrained equation of state, which, in addition, yields a maximum in the specific heats, $C_v(\rho,T)$, at the critical point.

2.6 The Ideal Gas Functions

We have developed a formulation of the spectroscopic specific heats, $C_p^0(T)$, of Chen, et al. [6], using $x \equiv T/100$,

$$C_p^0/R - 4 = \exp(-\epsilon/x) \cdot \sum_{i=1}^{7} A_i \cdot x^{1-i} , \qquad (7)$$

where,

ϵ	=	6.40	A_4 =	-3137.57293
A_1	=	43.59076	A_5 =	7742.58382
A_2	=	- 40.54350	A_6 =	-7583.91994
A_3	=	739.72837	A_7 =	3251.25208

Table 9 shows the "fit" of data used. In this table, the values for $(H^0-H_0^0)$ and for S^0 are obtained by numerical integration, starting at T = 300 K. Table 10 gives interpolated values at integral temperatures.

2.7 Thermaloop Computations

At temperatures from the triple- to the boiling-point, we have derived data for vapor pressures, saturated vapor densities, and for heats of vaporization by thermal loop computations for ΔH and for ΔS of saturated vapor and saturated liquid. Our procedure was given in [17], and more generally by Yarbrough and Tsai [43]. We use our virial eq. (5a), our ideal gas functions eq. (7), the heat of vaporization of Aston, et al. at the normal boiling point [1], and the following formulation of Aston's specific heats of the saturated liquid from the triple- to the boiling-point, as seen in table 11. Define $x(T) \equiv (T - T_0)/300$, when,

$$C_\sigma(T) = a + b \cdot x^2 + c \cdot x^3 + d \cdot x^4 \qquad (8)$$

in J/mol/K, where $T_0 = 95.00$ K is a fitting parameter, and

a	=	98.508 712	c =	-700.483 251
b	=	298.653 283	d	635.097 472

The irregular behavior of the data makes it difficult to develop a simple representation.

Computed results are given in table 12. The column headed P,EQN is vapor pressure via a preliminary equation; derived results are in column P,BAR. Heading Q,EQN gives formulated heats of vaporization via eq. (9); column Q,VAP gives derived results in kJ/mol.

2.8 The Heats of Vaporization

Table 13 shows the "fit" of our selected data. Those at ID = 40 we derived via thermal loops (section 2.7). Those at ID = 41 are from the Clapeyron equation. The formulation of these data in kilojoules/mol uses argument $x(T) \equiv (T_c - T)/(T_c - T_t)$,

$$Q_{vap}/Q_t = x + (x^\epsilon - x) \cdot [a + b \cdot x^2 + c \cdot x^3], \text{ kJ/mol} , \tag{9}$$

where $\epsilon = 0.45$, and,

Q_t = 28.208	b = -0.239 2491
a = 1.172 6829	c = -0.026 5020

The uncertainty of at least one percent in Q_{vap} at the higher temperatures will affect compressed liquid thermofunctions at these temperatures, because we use Q_{vap} to compute across the "dome."

2.9 Saturated Liquid Specific Heats

Specific heats $C_\sigma(T)$, along the saturated liquid path, are needed as a base to compute specific heats, $C_v(\rho,T)$ $C_p(\rho,T)$, in compressed liquid states.

We have used the ideal gas function $S^o(T)$, the equation of state, and the heats of vaporization to compute $S_\sigma(T)$ along the saturated liquid path at integral temperatures from the triple- to the critical-point. These are represented in J/mol/K by use of $x \equiv T/T_c$,

$$S_\sigma(T) - S_c = A_1 \cdot (1 - x)^\epsilon + A_2 \cdot \ln(x) + \sum_{i=3}^{5} A_i \cdot (1 - x)^{i-2} , \tag{10}$$

where $\epsilon = 0.45$, and

S_c	=	278.4457 6	A_3 =	-45.8024 5863
A_1	=	- 35.9738 7860	A_4 =	0.1943 2181
A_2	=	87.7051 4205	A_5 =	15.9816 4931

The rms deviation is 0.003 percent for 31 points.

The specific heats follow from the relation $C_\sigma(T) = T \cdot dS_\sigma/dT$, in J/mol/K,

$$C_\sigma(T) = -\epsilon \cdot A_1 \cdot x/(1-x)^{1-\epsilon} + A_2 - x \cdot \sum_{i=3}^{5} (i-2) \cdot A_i \cdot (1-x)^{i-3} \quad . \quad (11)$$

3. COMPUTATIONAL METHODS

The numerical values for E and H in this report are based on the assigned value, E = 0 at the liquid triple-point, obtained by use of the arbitrary value, E_0^0 = 23838.616 J/mol. Specific heats of Aston, et al. [1] could be integrated to give the solid at T = 0 as reference state.

3.1 The Homogeneous Domain

The homogeneous domain of fig. 1 includes all regions which can be attained along isotherms starting at zero density without crossing the vapor-liquid "dome," and without passing very close to the critical point at $T \geq T_c$.

We start our computations with ideal gas thermodynamic functions at zero density, and then integrate along isotherms by use of the equation of state in the following relations,

$$\Delta E = \int [P - T \cdot (\partial P/\partial T)] \cdot d\rho/\rho^2 \quad , \quad (12)$$

$$\Delta C_v = - T \cdot \int (\partial^2 P/\partial T^2) \cdot d\rho/\rho^2 \quad , \quad (13)$$

10

$$\Delta S = R \cdot \ln[P^0/(\rho RT)] + \int [R - (\partial P/\partial T)/\rho] \cdot d\rho/\rho \quad . \tag{14}$$

Equation (14) is for use with initial entropies in hypothetical ideal gas states at $P^0 = 1$ atm. For all other initial states we use

$$\Delta S = - \int (\partial P/\partial T) \cdot d\rho/\rho^2 \quad . \tag{14a}$$

In each (ρ,T) state, reached by above integrations, we compute

$$H = E + P \cdot v \quad , \tag{15}$$

$$C_p = C_v + T \cdot (\partial P/\partial T)^2/(\partial P/\partial \rho)/\rho^2 \quad , \tag{16}$$

$$W^2 = C_p \cdot (\partial P/\partial \rho)/C_v \quad . \tag{17}$$

3.2 The Saturated Liquid

At temperatures from the triple point up to the critical point, we first obtain thermofunctions for the saturated vapor via eqs. (12) through (15). We then use eq. (9) for the heat of vaporization, Q_{vap}, to compute

$$\Delta H = - Q, \qquad \Delta S = \Delta H/T \quad , \tag{18}$$

such that the free energy of vaporization, $\Delta F \equiv \Delta H - T \cdot \Delta S$, is zero. Having obtained H and S for the saturated liquid, we compute $E = H - P \cdot v$.

The single-phase specific heat, $C_v(\rho,T)$, at the saturated liquid boundary is obtained via eq. (11) for $C_\sigma(T)$ and the thermodynamic relation,

$$C_v(\rho,T) = C_\sigma(T) + T \cdot (\partial P/\partial T) \cdot (d\rho_\ell/dT)/\rho_\ell^2 \quad , \tag{19}$$

where ρ_ℓ is density of the saturated liquid. Values for $C_p(\rho,T)$ and $W(\rho,T)$ on this boundary follow from eqs. (16) and (17). For liquid at the boiling point we have obtained

11

$$T_b = 261.3587 \text{ K}, \qquad\qquad H_b = 16\ 794.0 \text{ J/mol},$$
$$E_b = 16\ 784.1 \text{ J/mol}, \qquad\qquad S_b = 200.999 \text{ J/mol/K}.$$

Equation (19) approches the difference of two infinities as $T \rightarrow T_c$. In present work, $C_v(\rho,T)_\sigma$ from eq. (19) becomes irregular at temperatures roughly above 370 K. We therefore use the following formulation for $C_v(\rho,T)_\sigma$, J/mol/K, at the saturated liquid boundary, at temperatures from 340 K to the critical, wherein $x \equiv (T - T_0)/(T_c - T_0)$, $T_0 = 340$ K,

$$(C_v)_\sigma = a + b \cdot x + c \cdot x^4/(1 - x)^\varepsilon , \tag{20}$$

where,

$$\varepsilon = 0.1 \qquad\qquad b = 13.480$$
$$a = 111.870 \qquad\qquad c = 5.380$$

3.3 The Compressed Liquid

Starting with above values for E, S, and C_v on the saturated liquid boundary, we use eqs. (12), (13), and (14a) to integrate along isotherms, and then obtain H, C_p, and W via eqs. (15), (16), and (17).

4. TESTS AND COMMENTS

Experimental data for isobutane from different laboratories, for the coexistence boundary and for the single-phase $P(\rho,T)$ surface, are of much lower precision than desired for thermal computations, tables 1, 2, 3, and 8. By use of the present, highly-constrained equation of state (6), however, we have developed a smooth and consistent $P(\rho,T)$ surface, as shown by derivatives given in tables 6, 19, and 20. The poor representation of some P-ρ-T data in table 8 must arise in part from an inaccurate coexistence boundary, because our equation of state is constrained to this boundary.

A condition for a well-behaved critical isotherm, table 6, is that, at the critical point, the slope of the critical isochore from the equation of state be equal to the slope of the vapor-pressure equation, $\partial P/\partial T = dP_\sigma/dT$. By trial in present work it became necessary to dimish dP_σ/dT at the critical point by raising the exponent in eq. (2) to $\varepsilon = 1.95$, and then also to increase $\partial P/\partial T$ at the c.p. by raising the assigned critical density from 3.80 mol/L (Beattie) to

3.86 mol/L. Following the above investigation, these two slopes at the c.p. were constrained to equality via the least-squares program [27].

To validate or orient present derived results relative to earlier work, we present some comparisons.

Table 14 compares specific heats, $C_p(T)$, from Sage and Lacey [34] with our results along isobars. Differences mostly are less than 10 percent. Table 15 compares densities, and differences of enthalpy and of entropy of [34] from our results along the subcritical isotherm at T = 250 F, 394.26 K. Enthalpy differences for the gas are quite large, as illustrated in fig. 3. Enthalpy differences from [34] along the saturated liquid path are compared with our results in fig. 4. Approaching the critical temperature, our differences become larger by 2 percent or more.

Table 16 compares densities, and differences of enthalpy and of entropy of Das, et al. [12] from our results along the supercritical isotherm at T = 440 K. Enthalpy differences are a few percent. Table 17 compares properties of the $P(\rho,T)$ surface, and of enthalpy differences from Starling, et al. [37] with our results along six isotherms (200 K through 500 K), at given densities. Partial derivatives from the equations of state, $\partial P/\partial \rho$, $\partial P/\partial T$, $\partial^2 P/\partial T^2$, are given under the table 17 headings DP/DD, DP/DT, D2P/DT2 respectively. As no P-ρ-T data exist for compressed liquid states below about 300 K, comparisons on the 200 K isotherm result from extrapolations of the MBWR equation of Starling, et al., and of our present equation of state. Density differences may be obtained from table 17 as, $\Delta\rho = \Delta P/(\partial P/\partial \rho)$. In many regions they are as large as 2 percent. Enthalpy differences, $H(\rho,T) - H^0(T)$, differ by only a few percent which, however, may be a large absolute quantity: at T = 300 K and ρ = 10.40 mol/L, the disagreement is (17,726 J/mol)·(2.63 percent) = 466 J/mol.

Figure 5 shows that our enthalpies extrapolate smoothly (along the isobar at P = 50 bar) at temperatures down to the triple point. The "jog" near T_c = 408 K is due to the large values of $C_p(\rho,T)$ in the critical region.

In conclusion, more accurate experimental data are needed for all P-ρ-T states, including vapor-pressures and orthobaric densities. Experimental specific heats for the saturated liquid from the triple-point to the highest practical temperature are needed (data of Aston, et al. to the boiling-point have a low precision). Experimental heats of vaporization over the widest practical temperature range are sorely needed, as well as specific-heat measurements in

13

single-phase domains. All of these deficiencies already have been recognized by Das, et al. [12], and by Starling, et al. [37].

During preparation of the present manuscript on isobutane in relation to LNG, new computational and experimental work for the U.S. Department of Energy was in progress at the National Bureau of Standards in Gaithersburg, Maryland.

The scaling laws have been applied to the critical-region data of Beattie, et al. [2,3] by J. M. H. Levelt Sengers [35]. She thus has derived new critical-point constants, concluding, however, that an appreciable impurity of n-butane would have only a very small effect on the dew- and bubble-point vapor pressures, and that these results might be altered by new data.

Experimental work at NBS, Gaithersburg, also is in progress on accurate vapor-pressure and single-phase P-ρ-T measurements. It is planned that following completion of these measurements a collaborative analysis and correlation effort, involving the work presented here and that at NBS-Gaithersburg, will be undertaken. The collaborative effort will produce an equation of state and tables that will supersede the provisional work provided here.

5. TABLES OF PHYSICAL AND THERMODYNAMIC PROPERTIES

5.1 Calculated P-ρ-T Isochores and Isotherms

Tables 18 and 19 give a selection of isochores and isotherms computed by equation of state (6). These are essential to examine behavior of the P(ρ,T) surface. They are a useful supplement to the isobars of table 22 for interpolating P-ρ-T values and their derivatives.

5.2 The Joule-Thomson Inversion Locus

Table 20 gives the P-ρ-T locus of the J.-T. inversion, $(\partial T/\partial P)_H = 0$, obtained from equation of state (6) under the condition $T \cdot (\partial P/\partial T) = \rho \cdot (\partial P/\partial \rho)$. This table has been computed to temperatures well above those of P-ρ-T data, to show approach to a maximum in P-T coordinates.

5.3 Thermophysical Properties of the Saturated Liquid

Table 21 gives physical and thermodynamic properties of saturated liquid isobutane computed by methods of section 3. Column headings are interpreted on the first page of this table.

14

5.4 Thermophysical Properties Along Selected Isobars

Table 22 gives physical and thermodynamic properties on isobars, computed by methods of section 3. Explanations for this table are given on the first page. This table is extrapolated below the minimum temperature (300 K), and above the maximum pressure ($\sim$ 400 bar) of most of the P-ρ-T data used for adjusting the equation of state.

6. ACKNOWLEDGMENTS

7. REFERENCES

[1]   Aston, J. G., Kennedy, R. M., and Schumann, S. C., The heat capacity and entropy, heats of fusion and vaporization and the vapor pressure of isobutane, J. Am. Chem. Soc. 62, 2059 (Aug 1940).

[2]   Beattie, J. A., Edwards, D. G., and Marple, S., Jr., The vapor pressure, orthobaric liquid density, and critical constants of isobutane, J. Chem. Phys. 17, No. 6, 576 (Jun 1949).

[3]   Beattie, J. A., Marple, S. Jr., and Edwards, D. G., The compressibility of, and an equation of state for gaseous isobutane, J. Chem. Phys. 18, No. 1, 127 (Jan 1950).

[4]   Benoliel, R. W., Some physical constants of seven four-carbon-atom hydrocarbons and neopentane, Thesis, Pennsylvania State College, Dept. Chem. Engrng., Petroleum Refining Laboratory, August, 1941.

[5]   Carney, B. R., Density of liquefied petroleum gas hydrocarbons, Petroleum Refiner 21, No. 9, 274 (Sep 1942).

[6]   Chen, S. S., Wilhoit, R. C., and Zwolinski, B. J., Ideal gas thermodynamic properties and isomerization of n-butane and isobutane, J. Phys. Chem. Ref. Data 4, No. 4, 859 (1975).

[7]   Coffin, C. C., and Maass, O., The preparation and physical properties of α-, β- and γ-butylene and normal and isobutane, J. Am. Chem. Soc. 50, 1427 (May 1928).

[8]   Connolly, J. F., Ideality of n-butane:isobutane solutions, J. Phys. Chem. 66, 1082 (1962).

[9]   Cragoe, C. S., Private NBS Letter Circular, Dec. 1943, quoted by G. H. Hanson.

[10]   Dana, L. I., Jenkins, A. C., Burdick, J. N., and Timm, R. L., Thermodynamic properties of butane, isobutane, and propane, Refrigeration Engineering 12, No. 12, 387 (Jun 1926).

[11]   Das, T. R., and Kuloor, N. R., Thermodynamic properties of hydrocarbons: Part II - Isobutane, Indian J. Technol. 5, 40 (1967).

[12]   Das, T. R., Reed, C. O., Jr., and Eubank, P. T., PVT surface and thermodynamic properties of isobutane, J. Chem. and Eng. Data 18, No. 3, 253 (1973).

[13]   Dymond, J. H., and Smith, E. B., The Virial Coefficients of Gases, Oxford Science Research Papers 2, Clarendon Press, Oxford (1969).

[14] Foehr, E. G., and Fenske, M. R., Magneto-optic rotation of hydrocarbons, Ind. Eng. Chem. $\underline{41}$, No. 9, 1956-66 (1949).

[15] Gilliland, E. R., and Scheeline, H. W., High-pressure vapor-liquid equilibrium, Ind. Eng. Chem. $\underline{32}$, No. 1, 48 (Jan 1940).

[16] Gilmour, J. B., Zwicker, J. O., et al., Fluorocarbon solutions at low temperatures, J. Phys. Chem. $\underline{71}$, No. 10, 3259 (Sep 1967).

[17] Goodwin, R. D., Provisional Thermodynamic Functions of Propane, from 85 to 700 K at Pressures to 700 Bar, Nat. Bur. Stand. (U.S.), Interagency Report NBSIR 77-860 (Jul 1977).

[17a] Goodwin, R. D., Modification of the nonanalytic equation of state for the limit of low densities, J. Res. Nat. Bur. Stand. (U.S.), $\underline{83}$ No. 4, 325 (1978).

[18] Goodwin, R. D., The nonanalytic equation of state for pure fluids applied to propane, Symposium on Equations of State in Engineering and Research, 176th National Meeting of the American Chemical Society, Miami Beach, Fla., Sept. 10-15, 1978. To be published in Advances in Chemistry Series.

[19] Goodwin, R. D., Normal Butane: Provisional Thermodynamic Functions from 135 to 700 K at Pressures to 700 Bar, Nat. Bur. Stand. (U.S.), Interagency Report (under review, Nov. 13, 1978).

[20] Gunn, R. D., M.S. Thesis, Univ. Calif., Berkeley (1958), quoted by J. A. Huff and T. M. Reed, J. Chem. Eng. Data $\underline{8}$, 306 (1963).

[21] Hanson, G. H., Thermodynamic properties of saturated propylene, propane, isobutane, isobutylene and normal butane, Chem. Eng. Progr. (Am. Inst. Chem. Engrs.) $\underline{42}$, 959 (1946).

[22] Haynes, W. M., and Hiza, M. J., Jr., Measurements of the orthobaric liquid densities of methane, ethane, propane, isobutane, and normal butane, J. Chem. Thermodynamics $\underline{9}$, 179 (1977).

[23] Jessen, F. W., and Lightfoot, J. H., Ind. Eng. Chem. (ind. Edn.) $\underline{30}$, 312 (1933).

[24] Kahre, L. C., Liquid density of light hydrocarbon mixtures, J. Chem. Eng. Data $\underline{18}$, No. 3, 267 (Jul 1973).

[25] Kestin, J., Khalifa, H. E., and Kumar, B., Thermodynamic and Transport Properties of Isobutane: A Survey of Available Data, Division of Engineering, Brown University, Providence, R.I. 02912. Report No. COO/4051-35 for Department of Energy, Division of Geothermal Energy, November, 1978.

[26] Kretschner, C. B., and Wiebe, R., J. Am. Chem. Soc. 73, 3778 (1951).

[27] McCarty, R. D., Least-squares computer subroutine, unpublished report, this laboratory, Jan. 3, 1972.

[28] McClune, C. R., Measurement of the densities of liquefied hydrocarbons from 93 to 173 K, Cryogenics, 289 (May 1976).

[28a] Milora, S. L., and Combs, S. K., Thermodynamic Representations of Ammonia and Isobutane, ORNL/TM-5847, prepared for Energy Research and Development Administration by Engineering Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tenn. 37830, May, 1977.

[29] Morris, W. M., Sage, B. H., and Lacey, W. N., Volumetric behavior of isobutane, Tech. Pub. No. 1128, Petroleum Technology (Am. Inst. Mining and Metallurgical Engineers, preprint) November, 1939.

[30] Orrit, J. E., and Laupretre, J. M., Density of liquefied natural gas components, Advances in Cryogenic Engineering, 23, 573-579 (1978).

[31] Pompe, A., and Spurling, T. H., Virial Coefficients for Gaseous Hydrocarbons, Tech. Paper No. 1, Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia (1974).

[32] Reeves, L. E., Scott, G. J., and Babb, S. E., Jr., Melting curves of pressure-transmitting fluids, J. Chem. Phys. 40, No. 12, 3662 (Jun 1964). Also, private communication on isobutane from Prof. S. E. Babb, Jr., October 2, 1978.

[33] Rodosevich, J. B., and Miller, R. C., Experimental liquid mixture densities for testing and improving correlations for liquefied natural gas, AIChE J. 19, No. 4, 729 (Jul 1973).

[34] Sage, B. H., and Lacey, W. N., Phase equilibrium in hydrocarbon systems, Thermodynamic properties of isobutane, Ind. Eng. Chem. 30, No. 6, 673 (1938).

[35] Sengers, J. M. H. Levelt, private communication, Dec. 5, 1978. See, for example, Universality of thermophysical properties near critical points, Proc. Seventh Symposium on Thermophysical Properties, United Engineering Center, 345 East 47th St., New York, N.Y. 10017. A. Cezairliyan, Editor, Am. Soc. Mech. Engrs. (held at NBS, Gaithersburg, Md., May 10-12, 1977), pp. 766-73.

[36] Sliwinski, P., Die Lorenz-Lorenz-Funktion von dampfformigem und flussigem Athan, Propan und Butan, Z. Physikalische Chemie Neue Folge 63, 263 (1969).

[37] Starling, K. E., Sliepcevich, L. W., Fish, K. M., et al., Development of
      Working Fluid Thermodynamic Properties Information for Geothermal Cycles -
      Phase I. University of Oklahoma, School of Chemical Engineering and
      Materials Science, Norman, Okla. [Prepared for the U.S. Energy Research and
      Development Administration, Dec. 31, 1977.]

[38] Strein, Von K., Lichtenthaler, R. N., Schramm, B., und Schafer, Kl.,
      Messwerte des zweiten Virialkoeffizienten einiger gesattigter
      Kohlenwasserstoffe von 300-500 K, Ber. Bunsenges Phys. Chem. 75, No. 12,
      1308 (1971).

[39] Tech. Committee, Natural Gasoline Assoc. Am., Densities of liquefied
      petroleum gases, Ind. Eng. Chem. 34, No. 10, 1240 (Oct 1942).

[40] Thompson, P. A., An explicit formula for the liquid-vapor saturation
      densities as a function of pressure, Symposium on EQUATIONS OF STATE IN
      ENGINEERING AND RESEARCH, 176th National Meeting of the American Chemical
      Society, Miami Beach, Fla., Sept 10-15, 1978.

[41] Van der Vet, A. P., (Dutch-Shell Labs., Amsterdam), Density,
      compressibility, expansion of light hydrocarbons and of light hydrocarbon
      blends, Congress Modial du Petrol II, 515, Paris, 1937.

[42] Wackher, R. C., Linn, C. B., and Grosse, A. Y., Physical properties of
      butanes and butenes, Ind. Eng. Chem. 37, No. 5, 464 (May 1945).

[43] Yarbrough, D. W., and Tsai, C.-H., Vapor pressures and heats of
      vaporization for propane and propene from 50 K to the normal boiling point,
      Paper M-7, pp. 602-610, Vol. 23, Advances in Cryogenic Engineering (1978).

APPENDIX A. Symbols and Units

Subscripts c and t refer to critical and liquid triple points.

Subscripts g and ℓ refer to saturated vapor and liquid.

Subscript σ refers to liquid-vapor coexistence (usually the liquid).

Superscript o refers to ideal gas states.

$\alpha, \beta, \gamma, \delta, \epsilon$	non-linear parameters in the equation of state
$B(\rho), C(\rho)$	density-dependent coefficients in the equation of state
$B^*(x)$	second virial coefficient
$C_v(\rho,T)$	molal heat capacity at constant volume, (J/mol)/K
$C_p(\rho,T)$	molal heat capacity at constant pressure, (J/mol)/K
$C_\sigma(T)$	molal heat capacity for saturated liquid, (J/mol)/K
d	density, mol/L
$E(\rho,T)$	the internal energy, J/mol
E_0^o	23,838.616 J/mol (arbitrary)
$f(\rho)$	used in the definition of $\theta(\rho)$
$F(\rho,T)$	definition in the equation of state
H_0^o	enthalpy for ideal gas state at T = 0
$H(\rho,T)$	the enthalpy, J/mol
J	the joule, 1 N-m
L	the liter, 10^{-3} m^3
mol	58.1243 grams of isobutane (C^{12} = 12 scale)
P	pressure in bars, 1 bar = 10^5N/m^2, (1 atm = 1.01325 bar)
$P_\sigma(T)$	the vapor pressure, bar
$P_\sigma(\rho)$	$P_\sigma[T_\sigma(\rho)]$, vapor pressure as function of density
$\Phi(\rho,T)$	function in the equation of state
$\Psi(\rho,T)$	function in the equation of state
Q_{vap}	ΔH_{vap}, the heat of vaporization, J/mol
R	the gas constant, 8.3145 (J/mol)/K, 0.083145 (bar-L/mol)/K
R^*	$(0.083145) \cdot d_c$, bar/K
ρ	d/d_c, density reduced at the critical point
$S(\rho,T)$	the entropy, (J/mol)/K
T	temperature, K
$T_\sigma(\rho)$	liquid-vapor coexistence temperature, K
$\theta(\rho)$	defined locus of temperatures
v	1/d, molal volume, L/mol
$\omega(\rho,T)$	$[1 - \theta(\rho)/T]$ for the equation of state

20

$W(\rho,T)$	the speed of sound, meters/second
$x(T)$	T/T_c for the equation of state
$x(T)$	variously defined for other equations
$x_\sigma(\rho)$	$T_\sigma(\rho)/T_c$, reduced temperature at coexistence, for the equation of state.

APPENDIX B. Fixed-Point Values for Isobutane

	Triple Point	Boiling Point	Critical Point
Temperature, K	113.55	261.359	408.00
Pressure, bar	$1.8893 \cdot 10^{-7}$	1.01325	36.5489
Density, mol/L			
Vapor	$2.001 \cdot 10^{-8}$	0.04840	3.86
Liquid	12.755	10.2163	3.86
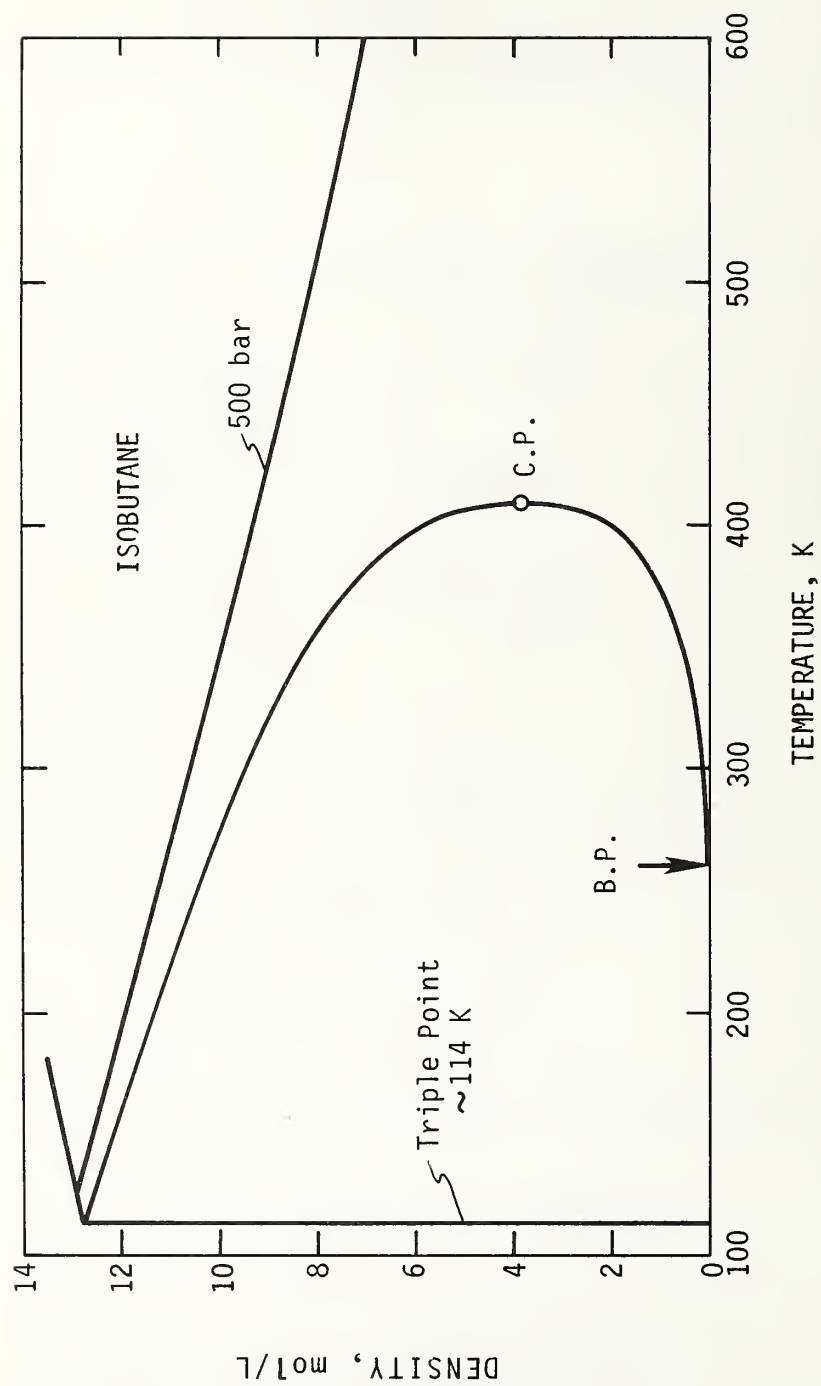
Figure 1.   The density-temperature diagram of isobutane
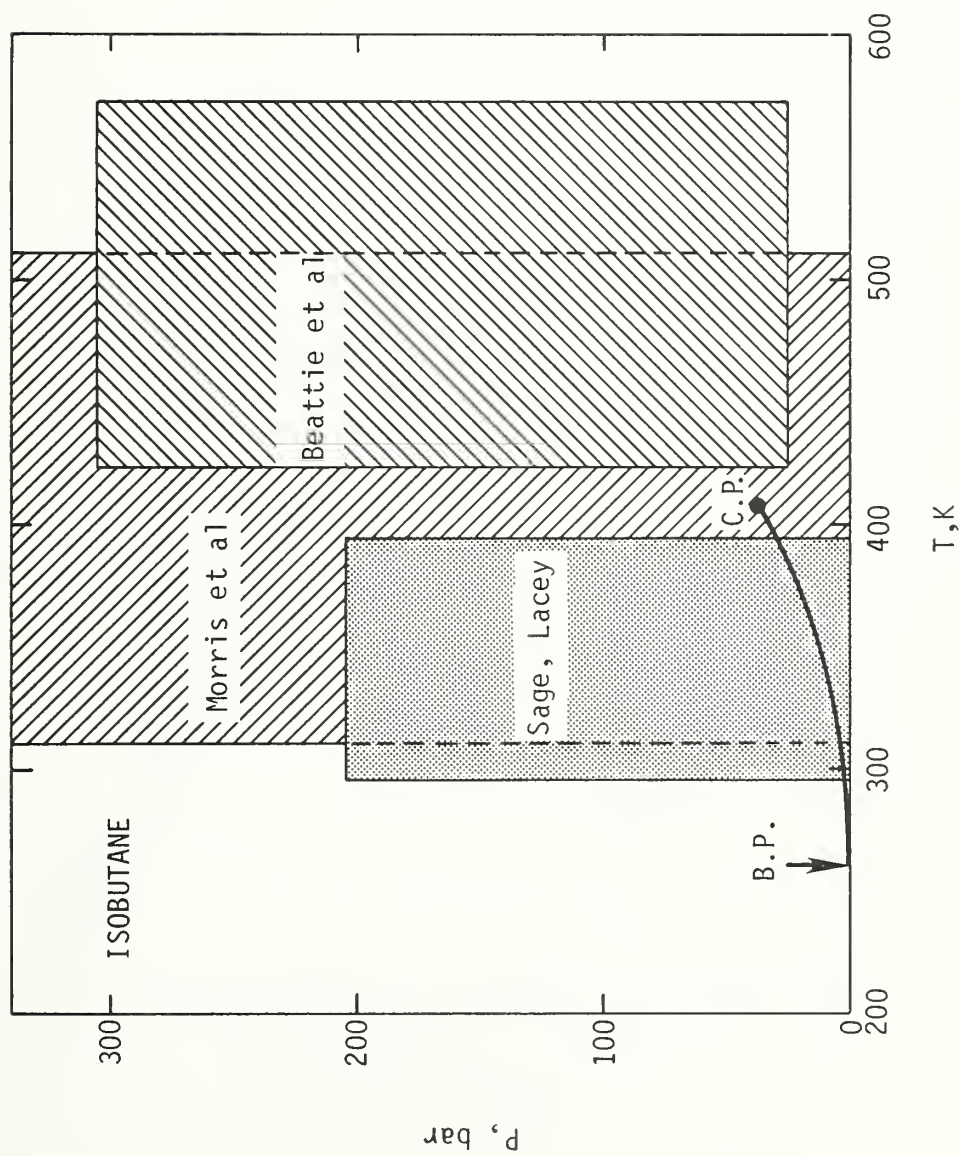
Figure 2. The P-T locus of P-ρ-T data for isobutane
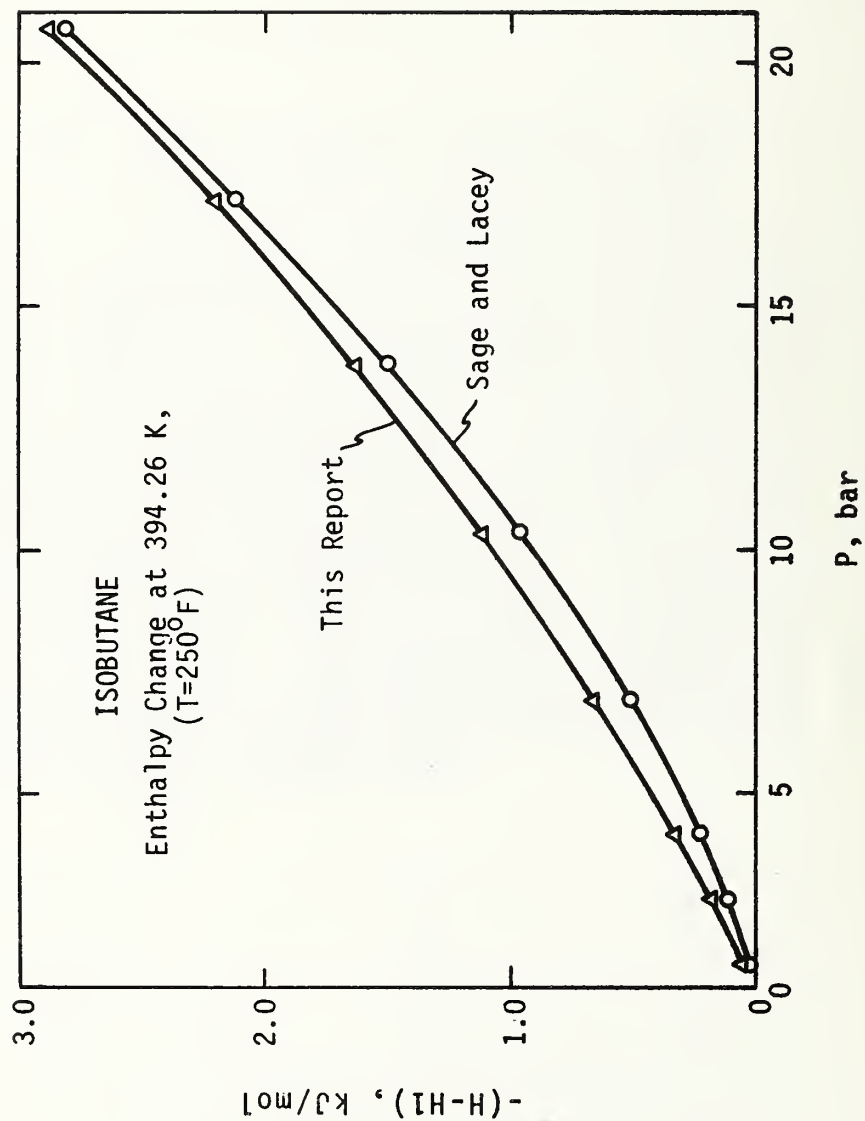
Figure 3. Comparison of enthalpies at T = 250 F
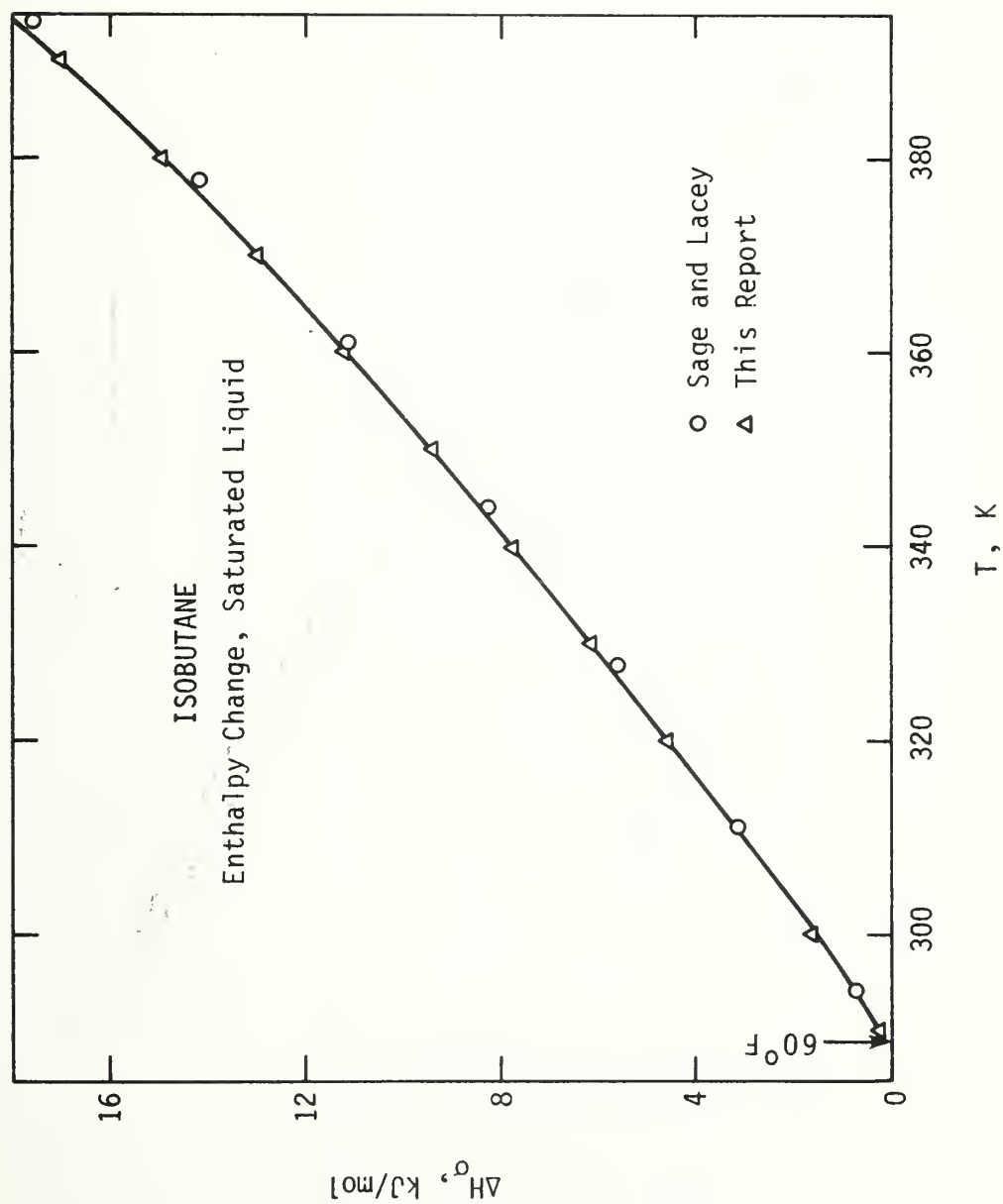
Figure 4. Comparison of enthalpies for saturated liquid
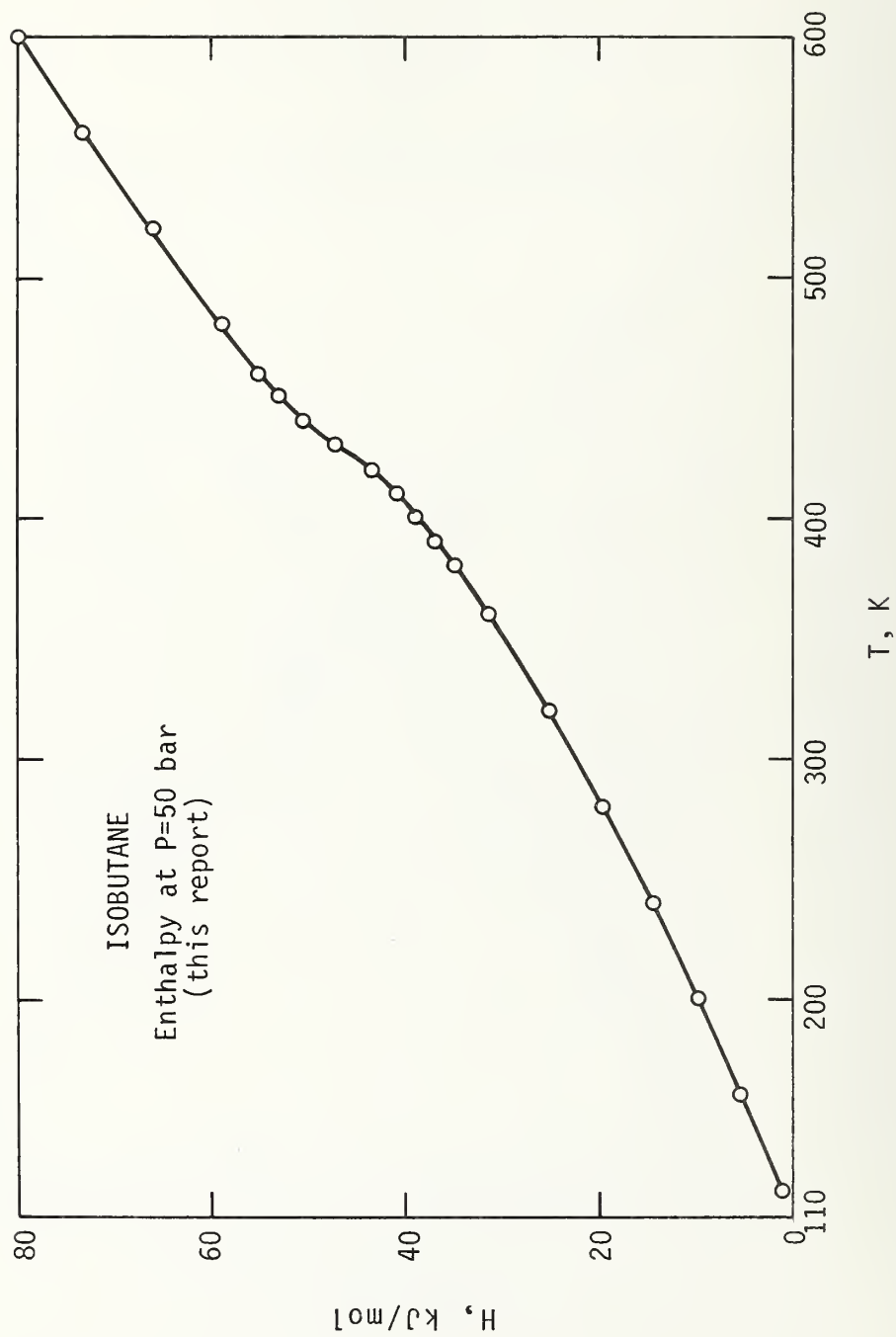
Figure 5. Calculated enthalpy at P = 50 bar

Table 1. Vapor pressures of isobutane

I-BUTANE VAPOR PRESSURES, EPP = 1.950

(1)ASTON,(2)BEATTIE,(3)CONNOLLY,(4)DANA,(5)MORRIS,
(6)SAGE/LACEY,(7)WACKHER,(8)GILLILAND,(9)GILMOUR,(40)THERMALOOPS.

TTRP =113.550, TCRT = 409.000
PTRP = .18893E-06, PCRT = 36.548852, DPSDT = .63410

   13.80835297   9.37269200 -70.54663008 112.75833458 -52.42140768   47.81122198

ID	WT	T,K	U	X	P,BAR	CALCD	PCNT	DPS/DT	RESID.
40	1.000	113.550	-2.59313	.27831	.18892E-06	.18893E-06	-.01	.497E-07	-.00000
40	1.000	115.000	-2.54783	.28186	.27523E-06	.27521E-06	.01	.704E-07	.00225
40	1.000	120.000	-2.40000	.29412	.93316E-06	.93301E-06	.02	.217E-06	.00923
40	1.000	125.000	-2.26400	.30637	.28423E-05	.28421E-05	.01	.6C5E-06	.01516
40	1.000	130.000	-2.13846	.31863	.78778E-05	.78785E-05	-.01	.154E-05	.02017
40	1.000	135.000	-2.02222	.33088	.20085E-04	.20091E-04	-.03	.361E-05	.02440
40	1.000	140.000	-1.91429	.34314	.47552E-04	.47569E-04	-.04	.787E-05	.02794
40	1.000	145.000	-1.81379	.35539	.10538E-03	.10541E-03	-.03	.161E-04	.03089
40	1.000	150.000	-1.72000	.36765	.22007E-03	.22013E-03	-.03	.312E-04	.03332
40	1.000	155.000	-1.63226	.37990	.43578E-03	.43583E-03	-.01	.574E-04	.03529
40	1.000	160.000	-1.55000	.39216	.82241E-03	.82237E-03	.00	.1C1E-03	.03685
40	1.000	165.000	-1.47273	.40441	.14861E-02	.14857E-02	.02	.170E-03	.03806
40	1.000	170.000	-1.40000	.41667	.25815E-02	.25803E-02	.04	.275E-03	.03896
40	1.000	175.000	-1.33143	.42892	.43261E-02	.43236E-02	.06	.432E-03	.03957
40	1.000	180.000	-1.26667	.44118	.70164E-02	.70117E-02	.07	.656E-03	.03994
40	1.000	185.000	-1.20541	.45343	.11044E-01	.11037E-01	.07	.970E-03	.04009
40	1.000	190.000	-1.14737	.46569	.16915E-01	.16904E-01	.07	.140E-02	.04005
40	1.000	195.000	-1.09231	.47794	.25263E-01	.25249E-01	.06	.197E-02	.03984
40	1.000	200.000	-1.04000	.49020	.36870E-01	.36854E-01	.04	.271E-02	.03949
40	1.000	205.000	-.99024	.50245	.52675E-01	.52665E-01	.02	.365E-02	.03900
40	1.000	210.000	-.94286	.51471	.73795E-01	.73799E-01	-.00	.484E-02	.03839
40	1.000	215.000	-.89767	.52696	.10153E+00	.10156E+00	-.03	.631E-02	.03769
40	1.000	220.000	-.85455	.53922	.13736E+00	.13744E+00	-.06	.810E-02	.03690
40	1.000	225.000	-.81333	.55147	.18297E+00	.18313E+00	-.09	.102E-01	.03603
40	1.000	230.000	-.77391	.56373	.24025E+00	.24053E+00	-.12	.128E-01	.03510
40	1.000	235.000	-.73617	.57598	.31127E+00	.31170E+00	-.14	.158E-01	.03412
40	1.000	240.000	-.70000	.58824	.39831E+00	.39893E+00	-.15	.192E-01	.03310
40	1.000	245.000	-.66531	.60049	.50383E+00	.50466E+00	-.16	.232E-01	.03203
1	1.000	245.584	-.66135	.60192	.52132E+00	.51834E+00	.58	.237E-01	.03230
40	1.000	250.000	-.63200	.61275	.63044E+00	.63153E+00	-.17	.277E-01	.03094
1	1.000	251.089	-.62492	.61541	.66405E+00	.66223E+00	.27	.287E-01	.03093
1	1.000	254.399	-.60378	.62353	.76350E+00	.76283E+00	.09	.321E-01	.03009
40	1.000	255.000	-.60000	.62500	.78097E+00	.78231E+00	-.17	.327E-01	.02982
7	1.000	258.150	-.58048	.63272	.88886E+00	.89090E+00	-.23	.362E-01	.02907
1	1.000	259.922	-.56970	.63706	.95476E+00	.95695E+00	-.23	.383E-01	.02667
40	1.000	260.000	-.56923	.63725	.95834E+00	.95995E+00	-.17	.384E-01	.02868
7	1.000	261.250	-.56172	.64032	.10106E+01	.10089E+01	.17	.399E-01	.02857
9	1.000	261.400	-.56083	.64069	.10133E+01	.10149E+01	-.16	.401E-01	.02836
1	1.000	261.551	-.55993	.64106	.10178E+01	.10210E+01	-.31	.403E-01	.02825
7	1.000	262.750	-.55281	.64400	.10654E+01	.10702E+01	-.45	.418E-01	.02790
4	1.000	279.810	-.45813	.68581	.19993E+01	.19892E+01	.51	.672E-01	.02438
4	1.000	287.780	-.41775	.70534	.25905E+01	.25821E+01	.33	.819E-01	.02238
4	1.000	295.230	-.38197	.72360	.32531E+01	.32479E+01	.16	.972E-01	.02052

Table 1. Continued

I-BUTANE VAPOR PRESSURES, EPP = 1.950

ID	WT	T,K	U	X	P,BAR	CALCD	PCNT	DPS/DT	RESID.
4	1.000	299.480	-.36236	.73402	.36877E+01	.36807E+01	.19	.107E+00	.01953
4	1.000	304.130	-.34153	.74542	.42143E+01	.42016E+01	.30	.118E+00	.01849
4	1.000	309.030	-.32026	.75743	.48268E+01	.48073E+01	.41	.130E+00	.01740
4	1.000	313.070	-.30322	.76733	.53782E+01	.53529E+01	.47	.140E+00	.01650
4	1.000	317.730	-.28411	.77875	.60502E+01	.60369E+01	.22	.153E+00	.01530
4	1.000	317.730	-.28411	.77875	.60462E+01	.60369E+01	.15	.153E+00	.01527
4	1.000	328.660	-.24140	.80554	.79167E+01	.78878E+01	.37	.186E+00	.01292
4	1.000	335.320	-.21675	.82186	.91526E+01	.91990E+01	-.50	.208E+00	.01102
3	1.000	344.260	-.18515	.84377	.11146E+02	.11198E+02	-.46	.240E+00	.00916
5	1.000	344.261	-.18515	.84378	.11128E+02	.11198E+02	-.62	.240E+00	.00908
6	1.000	344.261	-.18515	.84378	.11107E+02	.11198E+02	-.81	.240E+00	.00898
2	1.000	348.150	-.17191	.85331	.12090E+02	.12159E+02	-.57	.254E+00	.00831
4	1.000	352.640	-.15699	.86431	.13310E+02	.13341E+02	-.23	.272E+00	.00760
4	1.000	352.640	-.15699	.86431	.13395E+02	.13341E+02	.41	.272E+00	.00793
4	1.000	345.070	-.18237	.84576	.11364E+02	.11393E+02	-.26	.243E+00	.00910
6	1.000	360.928	-.13042	.88463	.15810E+02	.15740E+02	.44	.307E+00	.00637
3	1.000	360.930	-.13041	.88463	.15726E+02	.15741E+02	-.09	.307E+00	.00609
2	1.000	373.150	-.09339	.91458	.19832E+02	.19846E+02	-.07	.366E+00	.00398
3	1.000	377.590	-.08054	.92547	.21572E+02	.21523E+02	.23	.390E+00	.00342
5	1.000	377.594	-.08053	.92548	.21567E+02	.21525E+02	.19	.390E+00	.00341
6	1.000	377.594	-.08053	.92548	.21629E+02	.21525E+02	.48	.390E+00	.00356
3	1.000	394.260	-.03485	.96632	.28938E+02	.28872E+02	.23	.498E+00	.00120
6	1.000	394.261	-.03485	.96633	.28937E+02	.28873E+02	.22	.498E+00	.00120
2	1.000	398.150	-.02474	.97586	.30843E+02	.30868E+02	-.08	.529E+00	.00064
3	1.000	406.870	-.00278	.99723	.35788E+02	.35842E+02	-.15	.618E+00	-.00003
3	1.000	407.770	-.00056	.99944	.36325E+02	.36403E+02	-.22	.630E+00	-.00010
1	0.000	188.070	-1.16941	.46096	.15159E-01	.14383E-01	5.39	.122E-02	.04281
1	0.000	201.456	-1.02526	.49376	.42610E-01	.40978E-01	3.98	.296E-02	.04138
7	0.000	206.450	-.97627	.50600	.64395E-01	.58191E-01	10.66	.397E-02	.04413
7	0.000	215.150	-.89635	.52733	.11172E+00	.10251E+00	8.99	.636E-02	.04219
1	0.000	216.729	-.88254	.53120	.11579E+00	.11297E+00	2.50	.689E-02	.03874
7	0.000	228.750	-.78361	.56066	.23851E+00	.22497E+00	6.02	.121E-01	.03846
1	0.000	229.053	-.78125	.56140	.23233E+00	.22866E+00	1.60	.123E-01	.03618
7	0.000	237.350	-.71898	.58174	.36170E+00	.35055E+00	3.18	.173E-01	.03536
7	0.000	242.150	-.68491	.59350	.45596E+00	.44198E+00	3.16	.208E-01	.03436
4	0.000	249.140	-.63763	.61064	.62090E+00	.60808E+00	2.11	.269E-01	.03231
7	0.000	250.450	-.62907	.61385	.65488E+00	.64408E+00	1.68	.281E-01	.03180
4	0.000	255.500	-.59944	.62522	.79740E+00	.78526E+00	1.55	.328E-01	.03069
4	0.000	259.310	-.57341	.63556	.94580E+00	.93372E+00	1.29	.376E-01	.02960
4	0.000	261.000	-.56322	.63971	.10121E+01	.99896E+00	1.32	.396E-01	.02922
4	0.000	263.240	-.54992	.64520	.11430E+01	.10908E+01	4.78	.424E-01	.03047
4	0.000	270.910	-.50604	.66400	.14736E+01	.14558E+01	1.23	.530E-01	.02686
6	0.000	290.372	-.40509	.71170	.27579E+01	.28009E+01	-1.53	.870E-01	.02078
6	0.000	294.261	-.38652	.72123	.31006E+01	.31548E+01	-1.72	.951E-01	.01976
2	0.000	303.150	-.34587	.74301	.39932E+01	.40876E+01	-2.31	.115E+00	.01734
6	0.000	310.928	-.31220	.76208	.49580E+01	.50583E+01	-1.98	.135E+00	.01570
2	0.000	323.150	-.26257	.79203	.67898E+01	.69099E+01	-1.74	.169E+00	.01304
6	0.000	327.594	-.24544	.80293	.75704E+01	.76913E+01	-1.57	.183E+00	.01214
8	0.000	352.039	-.15896	.86284	.13652E+02	.13178E+02	3.60	.270E+00	.00969
8	0.000	372.594	-.09503	.91322	.19995E+02	.19643E+02	1.79	.363E+00	.00503
8	0.000	389.261	-.04814	.95407	.27234E+02	.26477E+02	2.86	.461E+00	.00315
8	0.000	403.150	-.01203	.98811	.33991E+02	.33626E+02	1.09	.576E+00	.00084
8	0.000	407.594	-.00100	.99900	.36887E+02	.36293E+02	1.64	.628E+00	.00087

NP = 69, RMSPCT =   .270

28

Table 2. Densities of saturated liquid

I-BUTANE SATURATED LIQUID DENSITIES, EL = .350

(1)BEATTIE,(2)CARNEY,(3)COFFIN,(4)CRAGOE,(5)DANA,
(6)FOEHR,(7)GILMOUR,(8)HAYNES,(9)MCCLUNE,(10)MORRIS,
(11)ORRIT,(12)SAGE/L,(13)SLIWINSKI,(14)T.C.NAT.GASO.A.A.,
(15)VANDERVET,(16)WACKHER,(17)PENN.STATE,
(18)KAHRE,(19)RODOSEVICH.

TTRP =113.550, TCRT = 408.000, DTRP = 12.755, DCRT = 3.860

.786913448   -.142753535   .057698164

ID	WT	T,K	X	MOL/L	CALCD	PCNT	DDS/DT	RESID.
19	1.000	114.000	.99847	12.754	12.748	.05	-.01643	1.36907
19	1.000	115.000	.99508	12.741	12.731	.07	-.01643	1.03008
8	5.000	115.075	.99482	12.731	12.730	.00	-.01643	.72094
19	1.000	120.000	.97809	12.665	12.649	.12	-.01644	.82790
8	5.000	120.075	.97784	12.649	12.648	.01	-.01644	.71315
9	1.000	123.150	.96740	12.583	12.597	-.11	-.01644	.62967
8	5.000	125.075	.96086	12.569	12.566	.02	-.01645	.72027
9	1.000	128.150	.95042	12.501	12.515	-.11	-.01646	.65834
11	1.000	129.478	.94591	12.483	12.493	-.08	-.01646	.67440
8	5.000	130.075	.94388	12.485	12.483	.01	-.01646	.71360
11	1.000	133.032	.93384	12.428	12.435	-.05	-.01647	.69145
9	1.000	133.150	.93344	12.420	12.433	-.10	-.01647	.67620
8	5.000	135.075	.92690	12.402	12.401	.00	-.01648	.71158
11	1.000	135.728	.92468	12.379	12.390	-.09	-.01648	.68447
9	1.000	138.150	.91645	12.341	12.350	-.07	-.01649	.69200
11	1.000	138.596	.91494	12.335	12.343	-.07	-.01649	.69490
8	5.000	140.075	.90992	12.322	12.318	.02	-.01650	.71807
11	1.000	141.445	.90526	12.294	12.296	-.02	-.01650	.70830
9	1.000	143.150	.89947	12.260	12.268	-.06	-.01651	.69984
11	1.000	144.033	.89647	12.247	12.253	-.05	-.01652	.70327
8	5.000	145.075	.89294	12.235	12.236	-.01	-.01652	.71311
11	1.000	146.745	.88726	12.202	12.208	-.06	-.01653	.70427
9	1.000	148.130	.88256	12.178	12.185	-.06	-.01654	.70417
8	5.000	150.075	.87596	12.153	12.153	.00	-.01655	.71635
11	1.000	150.360	.87499	12.162	12.149	.11	-.01655	.73518
11	1.000	152.693	.86706	12.106	12.110	-.03	-.01656	.71170
9	1.000	153.150	.86551	12.095	12.102	-.06	-.01657	.70768
11	1.000	155.443	.85772	12.058	12.064	-.05	-.01658	.71049
11	1.000	158.124	.84862	12.016	12.020	-.03	-.01660	.71458
9	1.000	158.150	.84853	12.013	12.019	-.05	-.01660	.71181
11	1.000	160.760	.83967	11.976	11.976	-.03	-.01662	.71654
9	1.000	163.150	.83155	11.930	11.936	-.05	-.01664	.71465
11	1.000	163.448	.83054	11.928	11.931	-.03	-.01664	.71814
11	1.000	166.140	.82140	11.884	11.887	-.02	-.01666	.71981
9	1.000	169.150	.81457	11.848	11.853	-.04	-.01668	.71850
11	1.000	171.559	.80299	11.793	11.796	-.03	-.01672	.72162
9	1.000	173.150	.79759	11.766	11.770	-.03	-.01673	.72225
11	1.000	174.459	.79314	11.745	11.748	-.03	-.01675	.72320
11	1.000	177.042	.78437	11.703	11.704	-.01	-.01677	.72575
11	1.000	179.875	.77475	11.656	11.657	-.01	-.01681	.72706
11	1.000	182.638	.76537	11.609	11.610	-.01	-.01684	.72787
11	1.000	185.429	.75589	11.560	11.563	-.02	-.01688	.72818
11	1.000	188.223	.74640	11.512	11.516	-.04	-.01692	.72814
11	1.000	194.542	.72494	11.407	11.409	-.01	-.01701	.73287
11	1.000	199.435	.70815	11.325	11.325	.00	-.01710	.73606
11	1.000	205.110	.68905	11.225	11.228	-.02	-.01720	.73643
11	1.000	210.673	.67015	11.132	11.132	.00	-.01732	.74025

Table 2. Continued

I-BUTANE SATURATED LIQUID DENSITIES, EL = .350

ID	WT	T,K	X	MOL/L	CALCD	PCNT	DDS/DT	RESID.
11	1.000	216.223	.65131	11.033	11.036	-.02	-.01744	.74112
11	1.000	221.684	.63276	10.937	10.940	-.02	-.01758	.74306
16	1.000	223.650	.62608	10.923	10.905	.16	-.01763	.75378
11	1.000	227.155	.61418	10.842	10.843	-.01	-.01773	.74567
2	1.000	227.594	.61269	10.841	10.836	.05	-.01775	.74906
8	5.000	228.000	.61131	10.827	10.828	-.01	-.01776	.74623
14	1.000	228.428	.60986	10.827	10.821	.06	-.01777	.74994
11	1.000	229.970	.60462	10.790	10.793	-.03	-.01782	.74569
14	1.000	232.261	.59684	10.756	10.752	.03	-.01789	.75002
11	1.000	232.686	.59539	10.741	10.745	-.04	-.01790	.74659
2	1.000	233.150	.59382	10.743	10.737	.06	-.01792	.75147
17	1.000	233.150	.59382	10.732	10.737	-.04	-.01792	.74654
16	1.000	233.650	.59212	10.748	10.728	.19	-.01793	.75832
11	1.000	235.557	.58564	10.688	10.693	-.05	-.01799	.74714
2	1.000	238.706	.57495	10.643	10.636	.06	-.01810	.75351
11	1.000	238.707	.57495	10.633	10.636	-.04	-.01810	.74900
14	1.000	238.983	.57401	10.636	10.631	.04	-.01811	.75284
11	1.000	241.431	.56570	10.583	10.587	-.04	-.01820	.74981
17	1.000	243.150	.55986	10.553	10.556	-.03	-.01826	.75112
16	1.000	243.650	.55816	10.566	10.547	.19	-.01828	.76102
11	1.000	244.259	.55609	10.531	10.535	-.05	-.01830	.75056
2	1.000	244.261	.55608	10.541	10.535	.06	-.01830	.75523
3	0.000	245.350	.55239	10.548	10.515	.31	-.01835	.76717
14	1.000	246.150	.54967	10.503	10.501	.02	-.01838	.75435
11	1.000	246.962	.54691	10.479	10.486	-.06	-.01841	.75079
11	1.000	249.415	.53858	10.439	10.440	-.02	-.01851	.75368
2	1.000	249.817	.53722	10.438	10.433	.05	-.01853	.75674
14	1.000	249.817	.53722	10.438	10.433	.05	-.01853	.75674
3	0.000	252.450	.52827	10.417	10.384	.32	-.01864	.76919
17	1.000	253.150	.52590	10.367	10.371	-.04	-.01867	.75415
16	1.000	253.650	.52420	10.382	10.362	.19	-.01869	.76429
2	1.000	255.372	.51835	10.337	10.329	.07	-.01877	.75945
14	1.000	255.372	.51835	10.336	10.329	.06	-.01877	.75925
14	1.000	255.483	.51797	10.335	10.327	.07	-.01877	.75972
3	0.000	257.350	.51163	10.331	10.292	.38	-.01886	.77286
3	0.000	259.550	.50416	10.288	10.251	.36	-.01897	.77287
7	1.000	261.000	.49924	10.225	10.223	.02	-.01904	.75926
3	0.000	261.950	.49601	10.249	10.205	.43	-.01908	.77611
17	1.000	263.150	.49193	10.176	10.182	-.06	-.01915	.75687
16	1.000	263.650	.49024	10.185	10.172	.12	-.01917	.76423
3	0.000	264.650	.48684	10.192	10.153	.38	-.01922	.77472
2	1.000	266.483	.48061	10.127	10.118	.09	-.01932	.76366
14	1.000	266.483	.48061	10.127	10.118	.09	-.01932	.76381
3	0.000	266.950	.47903	10.149	10.109	.40	-.01935	.77583
3	0.000	267.650	.47665	10.139	10.095	.43	-.01939	.77736
3	0.000	270.450	.46714	10.077	10.041	.36	-.01954	.77523
3	0.000	271.850	.46239	10.056	10.013	.42	-.01963	.77799
5	1.000	273.150	.45797	10.013	9.988	.25	-.01970	.77184
16	1.000	273.150	.45797	9.995	9.988	.07	-.01970	.76519
17	1.000	273.150	.45797	9.982	9.988	-.06	-.01970	.76033
3	0.000	273.850	.45560	10.015	9.974	.41	-.01975	.77788
2	1.000	277.150	.44439	9.913	9.909	.05	-.01995	.76547
14	1.000	277.150	.44439	9.913	9.909	.04	-.01995	.76540
3	0.000	277.450	.44337	9.956	9.903	.54	-.01997	.78332
18	1.000	277.550	.44303	9.901	9.901	.01	-.01998	.76413

Table 2. Continued

I-BUTANE SATURATED LIQUID DENSITIES, EL = .350

ID	WT	T,K	X	MOL/L	CALCD	PCNT	DDS/DT	RESID.
5	1.000	281.150	.43080	9.858	9.828	.30	-.02022	.77569
3	0.000	281.650	.42911	9.856	9.818	.39	-.02025	.77872
15	1.000	283.150	.42401	9.798	9.788	.11	-.02036	.76932
17	1.000	283.150	.42401	9.786	9.788	-.02	-.02036	.76506
13	5.000	283.200	.42384	9.782	9.787	-.05	-.02036	.76387
3	0.000	284.850	.41824	9.791	9.753	.39	-.02048	.77958
3	0.000	285.650	.41552	9.776	9.737	.41	-.02054	.78027
8	5.000	288.706	.40514	9.668	9.673	-.06	-.02077	.76530
2	1.000	288.706	.40514	9.679	9.673	.06	-.02077	.76936
14	1.000	288.706	.40514	9.679	9.673	.06	-.02077	.76926
15	1.000	288.710	.40513	9.686	9.673	.13	-.02077	.77175
18	1.000	288.750	.40499	9.680	9.673	.08	-.02078	.76997
5	1.000	289.150	.40363	9.686	9.664	.23	-.02081	.77501
8	5.000	290.000	.40075	9.641	9.646	-.06	-.02087	.76584
15	1.000	293.150	.39005	9.592	9.580	.12	-.02113	.77244
17	1.000	293.150	.39005	9.586	9.580	.06	-.02113	.77056
13	5.000	293.190	.38991	9.578	9.579	-.01	-.02113	.76816
3	0.000	293.350	.38937	9.619	9.576	.45	-.02115	.78332
12	1.000	294.261	.38628	9.626	9.557	.72	-.02122	.79248
5	1.000	297.150	.37646	9.514	9.495	.20	-.02148	.77612
15	1.000	298.150	.37307	9.485	9.474	.12	-.02157	.77380
3	0.000	298.450	.37205	9.514	9.467	.50	-.02159	.78584
2	1.000	299.817	.36741	9.438	9.438	.01	-.02172	.77080
14	1.000	299.817	.36741	9.438	9.438	.01	-.02172	.77067
18	1.000	299.850	.36729	9.438	9.437	.02	-.02172	.77105
8	5.000	300.000	.36679	9.430	9.434	-.04	-.02174	.76937
1	1.000	303.150	.35609	9.445	9.365	.86	-.02204	.79796
13	5.000	303.150	.35609	9.363	9.365	-.01	-.02204	.77096
15	1.000	303.150	.35609	9.377	9.365	.13	-.02204	.77535
5	1.000	305.150	.34930	9.342	9.320	.23	-.02225	.77907
15	1.000	308.150	.33911	9.266	9.253	.14	-.02256	.77704
2	1.000	310.928	.32967	9.196	9.190	.06	-.02287	.77534
10	0.000	310.928	.32967	9.245	9.190	.60	-.02287	.79118
12	1.000	310.928	.32967	9.245	9.190	.60	-.02287	.79121
14	1.000	310.928	.32967	9.196	9.190	.07	-.02287	.77541
18	1.000	310.950	.32960	9.194	9.189	.05	-.02288	.77496
13	5.000	313.120	.32223	9.138	9.140	-.02	-.02313	.77345
5	1.000	313.150	.32213	9.170	9.139	.34	-.02313	.78401
15	1.000	313.150	.32213	9.155	9.139	.17	-.02313	.77904
15	1.000	318.150	.30515	9.038	9.022	.18	-.02376	.78027
5	1.000	321.150	.29496	8.981	8.950	.35	-.02416	.78579
2	1.000	322.039	.29194	8.945	8.928	.18	-.02429	.78131
14	1.000	322.039	.29194	8.945	8.928	.19	-.02429	.78144
13	5.000	323.120	.28827	8.899	8.902	-.03	-.02444	.77552
1	1.000	323.150	.28816	8.912	8.901	.12	-.02445	.77983
15	1.000	323.150	.28816	8.917	8.901	.18	-.02445	.78143
18	1.000	327.550	.27322	8.776	8.792	-.18	-.02512	.77241
12	1.000	327.594	.27307	8.839	8.791	.55	-.02512	.79234
5	1.000	329.150	.26779	8.792	8.752	.46	-.02538	.79025
13	5.000	333.110	.25434	8.649	8.650	-.02	-.02606	.77818
2	1.000	333.150	.25420	8.663	8.649	.16	-.02606	.78282
14	1.000	333.150	.25420	8.662	8.649	.15	-.02606	.78267
13	5.000	343.080	.22048	8.380	8.381	-.01	-.02807	.78043
10	0.000	344.261	.21647	8.392	8.347	.54	-.02835	.79443
12	1.000	344.261	.21647	8.389	8.347	.50	-.02835	.79354

31

Table 2. Continued

I-BUTANE SATURATED LIQUID DENSITIES, EL = .350

ID	WT	T,K	X	MOL/L	CALCD	PCNT	DDS/DT	RESID.
1	1.000	348.150	.20326	8.258	8.235	.28	-.02931	.78846
13	5.000	353.090	.18648	8.087	8.087	-.01	-.03069	.78216
12	1.000	360.928	.15986	7.861	7.836	.31	-.03336	.79103
13	5.000	363.110	.15245	7.761	7.763	-.02	-.03424	.78328
13	5.000	368.100	.13551	7.582	7.586	-.05	-.03653	.78316
1	1.000	373.150	.11836	7.364	7.395	-.42	-.03939	.77524
10	0.000	377.594	.10326	7.254	7.213	.57	-.04252	.79873
12	1.000	377.594	.10326	7.254	7.213	.57	-.04252	.79863
1	1.000	398.150	.03345	6.073	6.054	.31	-.08208	.79455

NP = 146, RMSPCT =   .139

Table 3. Densities of saturated vapor

I-BUTANE SATURATED VAPOR DENSITIES, NF = 3, E = .35, EGX = 3.60

(1)DANA, (2)HANSON/CRAGOE, (3)SAGE/LACEY,
(4)SLIWINSKI, (40)THERMALOOPS, (50)THOMPSON.

TTRP = 113.550, TCRT = 408.000, DGAT = .2001147E-07, DCRT = 3.8600

-.7640518360E+00   .6505011822E+00   .3075066326E+02
 0.   0.   0.

ID	WT	T,K	MOL/L	CALCC	PCNT	Z,XPT	Z,CALC	F(Z)	DDS/DT
40	1.000	165.000	.10836E-03	.10836E-03	-.00	.99942	.99939	3.23837	.117E-04
40	1.000	170.000	.18273E-03	.18272E-03	.01	.99902	.99909	3.34509	.184E-04
40	1.000	175.000	.29756E-03	.29753E-03	.01	.99861	.99870	2.99665	.280E-04
40	1.000	180.000	.46938E-03	.46935E-03	.01	.99815	.99820	2.61038	.414E-04
40	1.000	185.000	.71922E-03	.71925E-03	-.00	.99762	.99758	2.24437	.594E-04
40	1.000	190.000	.10733E-02	.10734E-02	-.02	.99699	.99682	1.95572	.833E-04
40	1.000	195.000	.15632E-02	.15637E-02	-.03	.99625	.99592	1.71954	.114E-03
40	1.000	200.000	.22267E-02	.22277E-02	-.05	.99534	.99488	1.54094	.153E-03
40	1.000	205.000	.31077E-02	.31095E-02	-.06	.99425	.99368	1.39835	.201E-03
40	1.000	210.000	.42569E-02	.42593E-02	-.06	.99289	.99232	1.29471	.260E-03
40	1.000	215.000	.57314E-02	.57341E-02	-.05	.99125	.99079	1.21323	.332E-03
40	1.000	220.000	.75954E-02	.75968E-02	-.02	.98925	.98907	1.15293	.416E-03
40	1.000	225.000	.99193E-02	.99168E-02	.03	.98689	.98714	1.10396	.515E-03
40	1.000	230.000	.12781E-01	.12769E-01	.09	.98409	.98498	1.06575	.629E-03
40	1.000	235.000	.16265E-01	.16236E-01	.18	.98079	.98256	1.03646	.760E-03
40	1.000	240.000	.20463E-01	.20403E-01	.29	.97697	.97982	1.01270	.910E-03
2	1.000	244.261	.24630E-01	.24577E-01	.21	.97512	.97721	.92683	.105E-02
40	1.000	245.000	.25472E-01	.25364E-01	.43	.97259	.97673	.99282	.108E-02
1	1.000	249.817	.30930E-01	.30987E-01	-.18	.97515	.97336	.75412	.126E-02
40	1.000	250.000	.31397E-01	.31218E-01	.57	.96767	.97323	.97436	.127E-02
40	1.000	255.000	.38350E-01	.38068E-01	.74	.96213	.96926	.95865	.148E-02
1	1.000	255.372	.38440E-01	.38621E-01	-.47	.97350	.96895	.66237	.149E-02
2	1.000	255.372	.38540E-01	.38621E-01	-.21	.97098	.96895	.72551	.149E-02
40	1.000	260.000	.46451E-01	.46026E-01	.92	.95597	.96478	.94427	.171E-02
1	1.000	260.928	.47930E-01	.47635E-01	.62	.95795	.96389	.87528	.176E-02
2	1.000	266.483	.57900E-01	.58188E-01	-.50	.96290	.95813	.64967	.205E-02
2	1.000	277.594	.84280E-01	.84630E-01	-.41	.94814	.94422	.65997	.273E-02
1	1.000	283.150	.10170E+00	.10091E+00	.79	.92867	.93599	.78333	.313E-02
4	5.000	283.200	.10065E+00	.10106E+00	-.41	.93974	.93591	.66094	.314E-02
4	5.000	293.190	.13678E+00	.13636E+00	.31	.91598	.91881	.72028	.395E-02
4	5.000	303.150	.18065E+00	.18044E+00	.12	.89771	.89877	.70042	.492E-02
2	1.000	310.928	.22130E+00	.22210E+00	-.36	.88415	.88098	.67436	.581E-02
3	1.000	310.928	.22113E+00	.22210E+00	-.44	.88483	.88098	.67040	.581E-02
4	5.000	313.120	.23484E+00	.23512E+00	-.12	.87668	.87563	.68705	.608E-02
1	1.000	316.483	.25770E+00	.25630E+00	.55	.86237	.86711	.71786	.652E-02
2	1.000	322.039	.29600E+00	.29466F+00	.46	.84838	.85225	.71227	.730E-02
4	5.000	323.120	.30280E+00	.30264E+00	.05	.84879	.84923	.69638	.747E-02
1	1.000	327.594	.33980E+00	.33763E+00	.64	.83101	.83635	.71818	.818E-02
3	1.000	327.594	.33927E+00	.33763E+00	.49	.83230	.83635	.71266	.818E-02
4	5.000	333.110	.38469E+00	.38540E+00	-.18	.82103	.81952	.69142	.916E-02
1	1.000	333.150	.38490E+00	.38577E+00	-.23	.82124	.81939	.69016	.917E-02
4	5.000	343.080	.48603E+00	.48680E+00	-.16	.78764	.78622	.69790	.113E-01
4	5.000	353.090	.61214E+00	.61257E+00	-.07	.74919	.74866	.70737	.140E-01
4	5.000	363.110	.77162E+00	.77032E+00	.17	.70492	.70611	.72159	.177E-01
4	5.000	368.100	.86590E+00	.86447E+00	.17	.68157	.68269	.72755	.201E-01

Table 3. Continued

I-BUTANE SATURATED VAPOR DENSITIES, NF = 3, E = .35, EGX = 3.60

(1)DANA, (2)HANSON/CRAGOE, (3)SAGE/LACEY,
(4)SLIWINSKI, (40)THERMALOOPS, (50)THOMPSON.

TTRP = 113.550, TCRT = 408.000, DGAT = .2001147E-07, DCRT = 3.8600

  -.7640518360E+00   .6505011822E+00   .3075066326E+02
  0.   0.   0.

ID	WT	T,K	MOL/L	CALCD	PCNT	Z,XPT	Z,CALC	F(Z)	DDS/DT
40	0.000	113.550	.20010E-07	.20011E-07	-.01	1.00006	1.00000	**********	.509E-08
40	0.000	115.000	.28784E-07	.28782E-07	.01	.99994	1.00000	875.39293	.711E-08
40	0.000	120.000	.93527E-07	.93512E-07	.02	.99984	1.00000	753.65940	.210E-07
40	0.000	125.000	.27348E-06	.27346E-06	.01	.99992	1.00000	136.09852	.560E-07
40	0.000	130.000	.72884E-06	.72890E-06	-.01	1.00008	.99999	-54.09937	.137E-06
40	0.000	135.000	.17894E-05	.17899E-05	-.03	1.00026	.99998	-72.81902	.308E-06
40	0.000	140.000	.40852E-05	.40868E-05	-.04	1.00033	.99996	-41.80038	.647E-06
40	0.000	145.000	.87409E-05	.87442E-05	-.04	1.00029	.99992	-17.70619	.128E-05
40	0.000	150.000	.17647E-04	.17653E-04	-.03	1.00020	.99985	-6.30081	.238E-05
40	0.000	155.000	.33818E-04	.33826E-04	-.02	1.00000	.99975	.06221	.424E-05
40	0.000	160.000	.61834E-04	.61842E-04	-.01	.99974	.99960	2.48627	.719E-05
1	0.000	266.483	.58890E-01	.58188E-01	1.21	.94671	.95813	.93310	.205E-02
1	0.000	272.039	.71400E-01	.70459E-01	1.34	.93905	.95159	.90594	.237E-02
1	0.000	277.594	.85590E-01	.84630E-01	1.13	.93363	.94422	.84464	.273E-02
1	0.000	288.706	.12100E+00	.11950E+00	1.26	.91537	.92685	.80813	.357E-02
2	0.000	288.706	.11820E+00	.11950E+00	-1.09	.93705	.92685	.60108	.357E-02
1	0.000	294.261	.14190E+00	.14064E+00	.89	.90869	.91680	.76330	.405E-02
3	0.000	294.261	.13954E+00	.14064E+00	-.79	.92406	.91680	.63483	.405E-02
1	0.000	299.817	.16590E+00	.16460E+00	.79	.89873	.90581	.74598	.458E-02
2	0.000	299.817	.16310E+00	.16460E+00	-.91	.91416	.90581	.63233	.458E-02
1	0.000	305.372	.19400E+00	.19165E+00	1.23	.88303	.89388	.76381	.516E-02
1	0.000	310.928	.22410E+00	.22210E+00	.90	.87311	.88098	.73867	.581E-02
1	0.000	322.039	.29760E+00	.29466E+00	1.00	.84382	.85225	.73370	.730E-02
2	0.000	333.150	.39000E+00	.38577E+00	1.10	.81050	.81939	.73162	.917E-02
2	0.000	344.261	.50740E+00	.50027E+00	1.43	.77102	.78202	.73810	.115E-01
3	0.000	344.261	.50688E+00	.50027E+00	1.32	.77181	.78202	.73555	.115E-01
2	0.000	355.372	.65370E+00	.64534E+00	1.30	.72998	.73944	.73662	.147E-01
3	0.000	360.928	.74746E+00	.73271E+00	2.01	.70173	.71585	.75185	.168E-01
2	0.000	366.483	.84610E+00	.83263E+00	1.62	.67947	.69046	.74849	.193E-01
2	0.000	377.594	.11110E+01	.10833E+01	2.56	.61712	.63291	.77243	.265E-01
3	0.000	377.594	.11130E+01	.10833E+01	2.74	.61601	.63291	.77467	.265E-01
2	0.000	388.706	.14880E+01	.14429E+01	3.13	.54525	.56230	.79808	.399E-01
2	0.000	394.261	.17560E+01	.16971E+01	3.47	.50158	.51899	.81727	.527E-01
3	0.000	394.261	.17895E+01	.16971E+01	5.44	.49219	.51899	.83267	.527E-01
2	0.000	399.817	.21280E+01	.20503E+01	3.79	.44899	.46600	.84463	.777E-01
2	0.000	405.372	.27830E+01	.26549E+01	4.82	.37240	.39036	.89924	.165E+00

NP = 45, RMSPCT = .30

Table 4. Second virial coefficients

I-BUTANE SECOND VIRIAL COEFFICIENTS, EV = 3.00

(1)BEATTIE, (2)GUNN, (3)JESSEN, (4)KRETSCHNER,
(5)MORRIS/S/L, (6)SAGE/LACEY, (7)STREIN, (8)CONNOLLY.

.50084721   -1.10039322   -.64781233

ID	WT	T,K	X	B(T)	B*	CALC	DIF	PCT
3	1.000	273.16	.669	-889.00	-3.378	-3.304	-.074	-2.25
7	1.000	296.10	.726	-691.00	-2.626	-2.712	.086	3.19
3	1.000	303.16	.743	-699.00	-2.656	-2.561	-.095	-3.71
4	1.000	303.16	.743	-644.00	-2.447	-2.561	.114	4.45
7	1.000	308.10	.755	-634.00	-2.409	-2.463	.053	2.17
6	1.000	327.60	.803	-541.34	-2.057	-2.123	.066	3.09
7	1.000	333.90	.818	-532.50	-2.024	-2.027	.004	.18
6	1.000	344.27	.844	-524.24	-1.992	-1.883	-.109	-5.80
7	1.000	353.90	.867	-476.70	-1.811	-1.762	-.050	-2.82
7	1.000	373.90	.916	-427.60	-1.625	-1.543	-.082	-5.32
2	1.000	410.90	1.007	-310.60	-1.180	-1.227	.047	3.80
5	1.000	410.94	1.007	-329.72	-1.253	-1.227	-.026	-2.14
1	1.000	423.16	1.037	-289.38	-1.100	-1.142	.042	3.68
5	1.000	444.27	1.089	-256.50	-.975	-1.012	.038	3.71
2	1.000	444.30	1.089	-267.80	-1.018	-1.012	-.006	-.55
1	1.000	448.16	1.098	-253.65	-.964	-.991	.027	2.69
1	1.000	473.16	1.159	-223.20	-.848	-.864	.016	1.84
2	1.000	477.60	1.170	-230.20	-.875	-.844	-.031	-3.68
5	1.000	477.60	1.170	-223.06	-.848	-.844	-.004	-.46
1	1.000	498.16	1.221	-197.06	-.749	-.757	.008	1.07
2	1.000	510.90	1.252	-191.60	-.728	-.708	-.020	-2.77
5	1.000	510.94	1.252	-191.28	-.727	-.708	-.019	-2.62
1	1.000	523.16	1.282	-174.14	-.662	-.665	.003	.52
1	1.000	548.16	1.343	-153.27	-.582	-.586	.003	.58
1	1.000	573.16	1.404	-133.76	-.508	-.517	.008	1.61
6	0.000	294.27	.721	-620.77	-2.359	-2.754	.395	14.33
6	0.000	310.94	.762	-585.29	-2.224	-2.408	.184	7.65
8	0.000	344.26	.844	-457.20	-1.737	-1.883	.146	7.74
2	0.000	344.30	.844	-414.00	-1.573	-1.883	.309	16.43
8	0.000	360.93	.884	-412.70	-1.568	-1.680	.112	6.66
6	0.000	360.94	.884	-502.65	-1.910	-1.680	-.230	-13.70
8	0.000	377.59	.925	-374.00	-1.421	-1.507	.085	5.67
2	0.000	377.60	.925	-358.00	-1.360	-1.507	.146	9.70
6	0.000	377.60	.925	-488.54	-1.856	-1.507	-.350	-23.23
8	0.000	394.26	.966	-341.10	-1.296	-1.357	.061	4.47
6	0.000	394.27	.966	-466.83	-1.774	-1.357	-.417	-30.75
7	0.000	394.60	.967	-384.00	-1.459	-1.354	-.105	-7.77
8	0.000	406.87	.997	-318.30	-1.210	-1.257	.047	3.76
8	0.000	410.93	1.007	-311.50	-1.184	-1.227	.043	3.51
7	0.000	413.80	1.014	-349.90	-1.330	-1.206	-.124	-10.25
7	0.000	433.80	1.063	-320.00	-1.216	-1.074	-.142	-13.23
8	0.000	444.26	1.089	-259.60	-.986	-1.012	.026	2.55
7	0.000	453.60	1.111	-291.80	-1.109	-.961	-.148	-15.37
ID	WT	T,K	X	B(T)	B*	CALC	DIF	PCT
7	0.000	470.20	1.152	-267.20	-1.015	-.878	-.137	-15.65
7	0.000	494.00	1.210	-243.40	-.925	-.774	-.151	-19.56

NP = 25, RMSPCT = 2.99

35

Table 5. Coefficients of the equation of state

EQNSTATE COEFFICIENTS, ISOBUTANE

DGAT = .200114700E-07
DTRP = 12.7550, TTRP = 113.550, PTRP = .188930508E-06
DCRT = 3.8600, TCRT = 408.000, PCRT = 36.548852487

AL = 1.000, BE = .500, GA = .300
DE = .667, EP = 3.000, ER = 0.000, IX = 4

 -.05165511088   .62315236106   0.00000000000   0.00000000000
  .42083144154

MOL/L	TSAT	THETA	PSAT	B	C
.5	344.238	326.175	11.193	.6132	-.36629
1.0	374.282	362.046	20.264	.6577	-.31139
1.5	390.092	382.874	26.862	.7051	-.25554
2.0	399.151	395.513	31.402	.7558	-.19845
2.5	404.322	402.880	34.308	.8098	-.14065
3.0	406.982	406.614	35.911	.8674	-.08404
3.5	407.920	407.893	36.498	.9289	-.03204
4.0	407.996	407.994	36.546	.9946	.01080
4.5	407.686	407.534	36.351	1.0646	.04009
5.0	406.394	405.539	35.549	1.1392	.05341
5.5	403.568	401.046	33.867	1.2189	.05192
6.0	398.797	393.282	31.212	1.3039	.04049
6.5	391.795	381.685	27.668	1.3946	.02579
7.0	382.375	365.919	23.454	1.4914	.01335
7.5	370.424	345.890	18.867	1.5947	.00552
8.0	355.886	321.754	14.246	1.7048	.00178
8.5	338.751	293.924	9.933	1.8223	.00044
9.0	319.060	263.072	6.243	1.9477	.00008
9.5	296.923	230.109	3.415	2.0815	.00001
10.0	272.535	196.147	1.544	2.2242	.00000
10.5	246.189	162.410	.533	2.3765	.00000
11.0	218.260	130.124	.124	2.5390	.00000
11.5	189.168	100.384	.016	2.7123	.00000
12.0	159.321	74.036	.001	2.8973	.00000
12.5	129.059	51.616	.000	3.0946	.00000

TABLE 6. Calculated P(ρ) critical isotherm

The following page gives a high-resolution examination of the critical isotherm as computed by equation of state (6). Column headings have the following interpretations--

D/DC $\equiv$ d/d_c, density reduced at the critical point.

TS/TC $\equiv$ $T_\sigma(\rho)/T_c$, reduced coexistence temperature.

PS/PC $\equiv$ $P_\sigma(\rho)/P_c$, reduced coexistence pressure.

P/PC $\equiv$ P/P_c, pressure reduced at the critical point.

DP/DR $\equiv$ $\partial P/\partial \rho$ slope of the critical isotherm, bar.[*]

The last five columns give the density-dependence of functions used in the equation of state, where $R \equiv \rho \equiv d/d_t$ is density reduced at the liquid triple point--

DTS/DR $\equiv$ $dT_\sigma(\rho)/d\rho$, K.

DTH/DR $\equiv$ $d\theta(\rho)/d\rho$, K.

DPS/DR $\equiv$ $dP_\sigma(\rho)/d\rho$, bar.

DXB/DR $\equiv$ $\partial \phi(\rho,T)/\partial \rho$.

DXC/DR $\equiv$ $\partial \psi(\rho,T)/\partial \rho$.

[*]Note: $\rho \equiv d/d_t$, density reduced at the liquid triple-point.

Table 6. Calculated P(ρ) critical isotherm

THE CRITICAL ISOTHERM, ISOBUTANE

TC = 408.00, DC = 3.86, PC = 36.5488525, AT THE C.P., DPS/DT = .63410, DPS/DT = .63410, DP/DT = .63410

D/DC	TS/TC	PS/PC	P/PC	DP/DR	DTS/DR	DTH/DR	DPS/DR	DXB/DR	DXC/DR
.85	.9992037692	.9943838116	.9991682584	2.680517450	20.93373	28.35670	13.16182	-.05135	.21151
.86	.9993495139	.9954124765	.9993693396	2.186876107	18.38660	24.85502	11.57686	-.04509	.18884
.87	.9994768607	.9963081284	.9995320939	1.754327126	15.97421	21.55321	10.07073	-.03917	.16693
.88	.9995868379	.9970825433	.9996614696	1.380155372	13.70442	18.45934	8.64947	-.03360	.14587
.89	.9996805336	.9977430026	.9997621764	1.061308444	11.58542	15.58175	7.31923	-.02840	.12576
.90	.9997590965	.9982972955	.9998386565	.794372626	9.62543	12.92878	6.08608	-.02360	.10672
.91	.9998237360	.9987537053	.9998950540	.575560755	7.83236	10.50848	4.95585	-.01920	.08885
.92	.9998757177	.9991209788	.9999351838	.400715630	6.21357	8.32829	3.93388	-.01523	.07226
.93	.9999163586	.9994082767	.9999625023	.265332094	4.77539	6.39463	3.02479	-.01171	.05709
.94	.9999470181	.9996251060	.9999800797	.164599889	3.52291	4.71264	2.23228	-.00864	.04343
.95	.9999691562	.9997817213	.9999905988	.093306588	2.45598	3.28223	1.55666	-.00602	.03137
.96	.9999840172	.9998868798	.9999962409	.046638761	1.58469	2.11350	1.00461	-.00388	.02110
.97	.9999931259	.9999513442	.9999988468	.019075009	.90422	1.20168	.57330	-.00222	.01266
.98	.9999978928	.9999850843	.9999997820	.005412773	.41322	.54543	.26201	-.00101	.00619
.99	.9999997493	.9999982256	.9999999889	.000569243	.10179	.13484	.06454	-.00025	.00170
1.00	1.0000000000	1.0000000000	1.0000000000	0.000000000	0.00000	0.00000	0.00000	0.00000	0.00000
1.01	.9999998198	.9999987245	1.0000000079	-.000428219	-.07831	-.11137	-.04966	.00019	-.00132
1.02	.9999982041	.9999872878	1.0000001878	-.004658343	-.34901	-.48121	-.22130	.00086	-.00525
1.03	.9999941318	.9999584640	1.0000010070	-.016510593	-.75333	-1.05079	-.47764	.00185	-.01059
1.04	.9999866535	.9999055362	1.0000032492	-.039946389	-1.28479	-1.81360	-.81452	.00315	-.01719
1.05	.9999747583	.9998213597	1.0000080630	-.079360556	-1.94345	-2.76970	-1.23189	.00476	-.02496
1.06	.9999575199	.9996993946	1.0000169565	-.139260471	-2.72487	-3.91463	-1.72683	.00668	-.03380
1.07	.9999340417	.9995333245	1.0000318204	-.224379916	-3.62537	-5.24467	-2.29684	.00889	-.04364
1.08	.9999034524	.9993170259	1.0000549472	-.339697214	-4.64180	-6.75664	-2.93972	.01138	-.05439
1.09	.9998649029	.9990445497	1.0000890523	-.490452028	-5.77133	-8.44768	-3.65345	.01415	-.06599
1.10	.9998175637	.9987101100	1.0001372965	-.682160744	-7.01141	-10.31517	-4.43610	.01719	-.07841
1.11	.9997606239	.9983080759	1.0002033091	-.920630442	-8.35967	-12.35667	-5.28584	.02049	-.09158
1.12	.9996932892	.9978329674	1.0002912128	-1.211971411	-9.81387	-14.56985	-6.20086	.02406	-.10547
1.13	.9996147820	.9972794535	1.0004056492	-1.562608203	-11.37188	-16.95249	-7.17938	.02788	-.12004
1.14	.9995243398	.9966423504	1.0005518051	-1.979289149	-13.03167	-19.50242	-8.21961	.03196	-.13526
1.15	.9994212150	.9959166227	1.0007354398	-2.469094319	-14.79126	-22.21754	-9.31975	.03627	-.15109

TABLE 7. Summary of P-ρ-T data

ID	Authors	Range of the Data			Relative Deviations in Percent		
		d, mol/L	T, K	P, bar	NP	rms Δd/d	mean ΔP/P
2	Beattie [3]	1.00 - 8.0	423 - 573	26 - 308	75	0.84	0.41
3	Morris [29]	0.20 - 10.2	311 - 511	7 - 345	171	1.49	0.94
4	Sage [34]*	0.02 - 10.2	294 - 394	0.7 - 207	164	1.73	1.46
					246	1.27	0.73

*Not used for fitting.

39

Table 8. Comparisons with P-ρ-T data

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
2	1	.990	423.150	.9992	1.0017	-.25	26.041	25.995	.17
2	2	.994	448.150	.9992	1.0008	-.17	28.827	28.792	.12
2	3	.998	473.150	.9992	1.0000	-.08	31.542	31.524	.06
2	4	.997	498.150	.9992	1.0000	-.08	34.228	34.204	.07
2	5	.997	523.150	.9992	1.0001	-.09	36.872	36.843	.08
2	6	.992	548.150	.9992	1.0000	-.17	39.507	39.448	.15
2	7	.997	573.150	.9992	1.0002	-.10	42.060	42.023	.09
2	8	.946	423.150	1.4988	1.5115	-.85	33.488	33.337	.45
2	9	.970	448.150	1.4988	1.5063	-.50	38.129	38.009	.31
2	10	.990	473.150	1.4988	1.5022	-.23	42.617	42.550	.16
2	11	.992	498.150	1.4988	1.5016	-.19	47.055	46.989	.14
2	12	.991	523.150	1.4988	1.5016	-.19	51.422	51.346	.15
2	13	.986	548.150	1.4988	1.5024	-.24	55.749	55.637	.20
2	14	.980	573.150	1.4988	1.5032	-.30	60.025	59.872	.25
2	15	.966	423.150	1.9984	2.0155	-.86	38.341	38.208	.35
2	16	.987	448.150	1.9984	2.0054	-.35	45.079	44.993	.19
2	17	.993	473.150	1.9984	2.0024	-.20	51.645	51.580	.13
2	18	.999	498.150	1.9984	1.9989	-.03	58.029	58.017	.02
2	19	1.000	523.150	1.9984	1.9978	.03	64.321	64.336	-.02
2	20	.999	548.150	1.9984	1.9992	-.04	70.583	70.559	.03
2	21	.996	573.150	1.9984	2.0005	-.11	76.774	76.702	.09
2	22	.997	423.150	2.4980	2.5054	-.30	41.432	41.394	.09
2	23	.999	448.150	2.4980	2.4939	.16	50.409	50.449	-.08
2	24	.991	473.150	2.4980	2.4887	.37	59.133	59.267	-.23
2	25	.989	498.150	2.4980	2.4892	.35	67.746	67.913	-.25
2	26	.988	523.150	2.4980	2.4897	.33	76.227	76.421	-.26
2	27	.996	548.150	2.4980	2.4933	.19	84.687	84.819	-.16
2	28	1.000	573.150	2.4980	2.4965	.06	93.077	93.124	-.05
2	29	.990	423.150	2.9976	2.9717	.86	43.418	43.509	-.21
2	30	.978	448.150	2.9976	2.9765	.70	54.756	54.933	-.32
2	31	.967	473.150	2.9976	2.9781	.65	65.882	66.141	-.39
2	32	.977	498.150	2.9976	2.9835	.47	76.936	77.193	-.33
2	33	.984	523.150	2.9976	2.9872	.35	87.879	88.122	-.28
2	34	.996	548.150	2.9976	2.9928	.16	98.812	98.949	-.14
2	35	1.000	573.150	2.9976	2.9973	.01	109.684	109.692	-.01
2	36	.954	423.150	3.4972	3.4289	1.95	44.877	45.077	-.45
2	37	.943	448.150	3.4972	3.4607	1.04	58.687	58.981	-.50
2	38	.958	473.150	3.4972	3.4742	.66	72.458	72.767	-.43
2	39	.986	438.150	3.4972	3.4859	.32	86.248	86.463	-.25
2	40	.997	523.150	3.4972	3.4924	.14	99.967	100.086	-.12
2	41	.997	548.150	3.4972	3.5008	-.10	113.758	113.645	.10
2	42	.984	573.150	3.4972	3.5059	-.25	127.467	127.149	.25
2	43	.854	423.150	3.9967	3.8759	3.02	46.204	46.585	-.82
2	44	.887	448.150	3.9967	3.9472	1.24	62.771	63.216	-.71
2	45	.960	473.150	3.9967	3.9755	.53	79.560	79.884	-.41
2	46	.998	498.150	3.9967	3.9926	.10	96.482	96.571	-.09
2	47	.995	523.150	3.9967	4.0024	-.14	113.423	113.263	.14
2	48	.960	548.150	3.9967	4.0119	-.38	130.486	129.953	.41
2	49	.914	573.150	3.9967	4.0182	-.54	147.539	146.635	.61
2	50	.717	423.150	4.4963	4.3512	3.23	47.825	48.422	-1.25
2	51	.818	448.150	4.4963	4.4409	1.23	67.655	68.285	-.93
2	52	.954	473.150	4.4963	4.4763	.44	87.980	88.361	-.43
2	53	1.000	498.150	4.4963	4.4981	-.04	108.620	108.574	.04
2	54	.970	523.150	4.4963	4.5095	-.29	129.341	128.882	.35
2	55	.889	548.150	4.4963	4.5209	-.55	150.316	149.257	.70

40

Table 8. Continued

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
2	56	.826	573.150	4.4963	4.5267	-.68	171.239	169.676	.91
2	57	.562	423.150	4.9959	4.8662	2.60	50.359	51.246	-1.76
2	58	.729	448.150	4.9959	4.9406	1.11	74.312	75.217	-1.22
2	59	.926	473.150	4.9959	4.9742	.44	98.964	99.532	-.57
2	60	1.000	498.150	4.9959	4.9950	.02	124.042	124.077	-.03
2	61	.967	523.150	4.9959	5.0074	-.23	149.313	148.787	.35
2	62	.878	548.150	4.9959	5.0185	-.45	174.877	173.614	.72
2	63	.800	573.150	4.9959	5.0255	-.59	200.472	198.524	.97
2	64	.312	423.150	5.9951	5.9150	1.34	63.916	65.853	-3.03
2	65	.453	448.150	5.9951	5.9374	.96	99.714	101.991	-2.28
2	66	.653	473.150	5.9951	5.9563	.65	136.323	138.444	-1.56
2	67	.859	498.150	5.9951	5.9723	.38	173.519	175.111	-.92
2	68	.959	523.150	5.9951	5.9819	.22	210.807	211.922	-.53
2	69	.998	548.150	5.9951	5.9944	.01	248.763	248.830	-.03
2	70	.324	423.150	6.9943	6.9469	.68	108.073	111.413	-3.09
2	71	.585	448.150	6.9943	6.9606	.48	162.566	165.664	-1.91
2	72	.764	473.150	6.9943	6.9686	.37	217.058	219.970	-1.34
2	73	.966	498.150	6.9943	6.9819	.18	272.615	274.281	-.61
2	74	.842	423.150	7.9935	8.0007	-.09	227.687	226.464	.54
2	75	.761	448.150	7.9935	8.0057	-.15	307.815	305.394	.79

NP = 75, DNRMSPCT = .835, PMEANDIF = .459, PMEANPCT = .408

Table 8. Continued

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
3	76	.000	310.928	9.2542	9.1987	.60	6.895	18.949	-174.84
3	77	.826	410.928	.2167	.2145	1.00	6.895	6.959	-.94
3	78	.926	444.261	.1964	.1952	.61	6.895	6.935	-.58
3	79	.866	477.594	.1811	.1796	.83	6.895	6.950	-.80
3	80	.872	510.928	.1678	.1665	.80	6.895	6.949	-.78
3	81	.001	310.928	9.2822	9.2308	.55	13.790	25.303	-83.49
3	82	.003	344.261	8.4098	8.3688	.49	13.790	18.901	-37.07
3	83	.869	410.928	.4705	.4661	.94	13.790	13.900	-.80
3	84	.982	444.261	.4154	.4140	.33	13.790	13.830	-.30
3	85	.916	477.594	.3776	.3750	.68	13.790	13.876	-.63
3	86	.902	510.928	.3466	.3441	.72	13.790	13.883	-.68
3	87	.002	310.928	9.3420	9.2921	.53	27.579	39.437	-43.00
3	88	.010	344.261	8.5164	8.4756	.48	27.579	33.279	-20.67
3	89	.159	377.594	7.3569	7.3336	.32	27.579	28.872	-4.69
3	90	.962	410.928	1.1951	1.2028	-.65	27.579	27.476	.37
3	91	.983	444.261	.9589	.9619	-.31	27.579	27.516	.23
3	92	.998	477.594	.8296	.8301	-.06	27.579	27.565	.05
3	93	.999	510.928	.7412	.7405	.10	27.579	27.603	-.09
3	94	.931	410.928	1.5570	1.5750	-1.16	31.716	31.550	.52
3	95	.945	410.928	1.7203	1.7402	-1.16	33.095	32.942	.46
3	96	.947	410.928	1.9178	1.9436	-1.35	34.474	34.317	.46
3	97	.970	444.261	1.3180	1.3243	-.48	34.474	34.366	.31
3	98	.983	477.594	1.0962	1.0994	-.29	34.474	34.397	.22
3	99	.996	510.928	.9616	.9627	-.11	34.474	34.442	.09
3	100	.985	410.928	2.1959	2.2155	-.89	35.853	35.769	.23
3	101	.998	410.928	2.3923	2.4006	-.35	36.542	36.515	.07
3	102	.990	410.928	2.6939	2.6565	1.39	37.232	37.311	-.21
3	103	.959	410.928	3.2965	3.1098	5.66	37.921	38.080	-.42
3	104	.791	410.928	4.6318	4.2078	9.15	38.611	39.006	-1.02
3	105	.751	410.928	5.0016	4.8134	3.76	39.300	39.752	-1.15
3	106	.356	410.928	5.3203	5.0770	4.57	39.990	41.065	-2.69
3	107	.005	410.928	9.3994	9.3499	.53	41.369	53.782	-30.01
3	108	.024	344.261	8.6068	8.5714	.41	41.369	46.811	-13.16
3	109	.294	377.594	7.5711	7.5524	.25	41.369	42.729	-3.29
3	110	.149	410.928	5.6243	5.3720	4.49	41.369	43.352	-4.79
3	111	.987	444.261	1.7814	1.7876	-.34	41.369	41.289	.19
3	112	.972	477.594	1.3982	1.4041	-.42	41.369	41.244	.30
3	113	.987	510.928	1.1998	1.2027	-.24	41.369	41.289	.19
3	114	.060	410.928	6.1791	5.9900	3.06	48.263	52.111	-7.97
3	115	.986	444.261	2.4260	2.4119	.58	48.263	48.396	-.27
3	116	.956	477.594	1.7398	1.7499	-.58	48.263	48.075	.39
3	117	.990	510.928	1.4581	1.4612	-.21	48.263	48.184	.16
3	118	.009	310.928	9.4510	9.4047	.49	55.158	67.364	-22.13
3	119	.037	344.261	8.6937	8.6587	.40	55.158	61.039	-10.66
3	120	.366	377.594	7.7435	7.7256	.23	55.158	56.743	-2.87
3	121	.034	410.928	6.4921	6.2999	2.96	55.158	61.122	-10.81
3	122	.955	444.261	3.3005	3.2663	1.04	55.158	55.406	-.45
3	123	.991	477.594	2.1364	2.1415	-.24	55.158	55.073	.15
3	124	.989	510.928	1.7344	1.7383	-.23	55.158	55.062	.17
3	125	.765	444.261	4.2438	4.1666	1.82	62.053	62.736	-1.10
3	126	1.000	477.594	2.5828	2.5799	.11	62.053	62.097	-.07
3	127	.996	510.928	2.0309	2.0331	-.11	62.053	62.002	.08
3	128	.012	310.928	9.5031	9.4568	.49	68.948	81.777	-18.61
3	129	.049	344.261	8.7740	8.7389	.40	68.948	75.315	-9.24
3	130	.526	377.594	7.8853	7.8707	.18	68.948	70.447	-2.18

Table 8. Continued

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
3	131	.182	410.928	6.7563	6.6904	.97	68.948	71.973	-4.39
3	132	.720	444.261	4.8820	4.8187	1.30	68.948	69.804	-1.24
3	133	.995	477.594	3.0642	3.0563	.26	68.948	69.059	-.16
3	134	1.000	510.928	2.3435	2.3435	-.00	68.948	68.947	.00
3	135	.016	310.928	9.5658	9.5186	.49	86.184	100.038	-16.07
3	136	.061	344.261	8.8671	8.8311	.41	86.184	93.331	-8.29
3	137	.714	377.594	8.0370	8.0258	.14	86.184	87.538	-1.57
3	138	.101	410.928	7.0955	7.0145	1.14	86.184	91.505	-6.17
3	139	.377	444.261	5.7655	5.6895	1.32	86.184	88.448	-2.63
3	140	1.000	477.594	4.1921	4.1928	-.02	86.184	86.172	.01
3	141	.998	510.928	3.1565	3.1592	-.09	86.184	86.127	.07
3	142	.023	310.928	9.6225	9.5770	.47	103.421	117.501	-13.61
3	143	.080	344.261	8.9506	8.9159	.39	103.421	110.880	-7.21
3	144	.884	377.594	8.1680	8.1601	.10	103.421	104.512	-1.05
3	145	.364	410.928	7.2927	7.2562	.50	103.421	106.398	-2.88
3	146	.245	444.261	6.2478	6.1666	1.30	103.421	107.171	-3.63
3	147	.962	477.594	4.9647	4.9794	-.30	103.421	103.016	.39
3	148	.961	510.928	3.9118	3.9290	-.44	103.421	103.002	.41
3	149	.030	310.928	9.6766	9.6325	.46	120.658	134.971	-11.86
3	150	.108	344.261	9.0269	8.9945	.36	120.658	128.118	-6.18
3	151	.989	377.594	8.2834	8.2791	.05	120.658	121.328	-.56
3	152	.664	410.928	7.4726	7.4518	.28	120.658	122.690	-1.68
3	153	.277	444.261	6.5664	6.4996	1.02	120.658	124.755	-3.40
3	154	.992	477.594	5.4909	5.4949	-.07	120.658	120.499	.13
3	155	.928	510.928	4.5297	4.5510	-.47	120.658	119.985	.56
3	156	.039	310.928	9.7278	9.6854	.44	137.895	152.314	-10.46
3	157	.115	344.261	9.1014	9.0679	.37	137.895	146.158	-5.99
3	158	.980	377.594	8.3868	8.3862	.01	137.895	137.997	-.07
3	159	.924	410.928	7.6277	7.6172	.14	137.895	139.076	-.86
3	160	.280	444.261	6.8198	6.7581	.90	137.895	142.589	-3.40
3	161	.994	477.594	5.8661	5.8679	-.03	137.895	137.802	.07
3	162	.885	510.928	5.0016	5.0251	-.47	137.895	136.923	.71
3	163	.051	310.928	9.7762	9.7360	.41	155.132	169.391	-9.19
3	164	.147	344.261	9.1680	9.1367	.34	155.132	163.323	-5.28
3	165	.929	377.594	8.4823	8.4838	-.02	155.132	154.850	.18
3	166	.994	410.928	7.7631	7.7614	.02	155.132	155.352	-.14
3	167	.276	444.261	7.0304	6.9709	.85	155.132	160.510	-3.47
3	168	1.000	477.594	6.1639	6.1602	.06	155.132	155.381	-.16
3	169	.838	510.928	5.3679	5.3928	-.46	155.132	153.836	.84
3	170	.083	310.928	9.8179	9.7844	.34	172.369	184.750	-7.18
3	171	.201	344.261	9.2294	9.2016	.30	172.369	180.056	-4.46
3	172	.836	377.594	8.5693	8.5737	-.05	172.369	171.499	.50
3	173	.850	410.928	7.8830	7.8894	-.08	172.369	171.460	.53
3	174	.301	444.261	7.2068	7.1523	.76	172.369	178.057	-3.30
3	175	.996	477.594	6.4076	6.4012	.10	172.369	172.863	-.29
3	176	.915	510.928	5.6752	5.6898	-.26	172.369	171.445	.54
3	177	.097	310.928	9.8636	9.8309	.33	189.606	202.176	-6.63
3	178	.206	344.261	9.2916	9.2630	.31	189.606	197.943	-4.40
3	179	.741	377.594	8.6500	8.6571	-.08	189.606	188.102	.79
3	180	.637	410.928	7.9904	8.0049	-.18	189.606	187.355	1.19
3	181	.332	444.261	7.3608	7.3109	.68	189.606	195.493	-3.10
3	182	.995	477.594	6.6136	6.6070	.10	189.606	190.218	-.32
3	183	.935	510.928	5.9279	5.9387	-.18	189.606	188.800	.42
3	184	.123	310.928	9.9062	9.8756	.31	206.843	219.023	-5.89
3	185	.245	344.261	9.3484	9.3214	.29	206.843	215.095	-3.99
3	186	.610	377.594	8.7240	8.7349	-.13	206.843	204.353	1.20

43

Table 8. Continued

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
3	187	.530	410.928	8.0913	8.1102	-.23	206.843	203.640	1.55
3	188	.557	444.261	7.4848	7.4520	.44	206.843	211.122	-2.07
3	189	.995	477.594	6.7879	6.7867	.02	206.843	206.971	-.06
3	190	.984	510.928	6.1502	6.1532	-.05	206.843	206.581	.13
3	191	.171	310.928	9.9455	9.9187	.27	224.080	235.139	-4.94
3	192	.352	344.261	9.3994	9.3770	.24	224.080	231.233	-3.19
3	193	.594	377.594	8.7964	8.8079	-.13	224.080	221.279	1.25
3	194	.421	410.928	8.1826	8.2071	-.30	224.080	219.589	2.00
3	195	.867	444.261	7.5962	7.5793	.22	224.080	226.495	-1.08
3	196	.721	477.594	6.9261	6.9464	-.29	224.080	221.780	1.03
3	197	1.000	510.928	6.3456	6.3420	.06	224.080	224.431	-.16
3	198	.212	310.928	9.9851	9.9602	.25	241.316	251.926	-4.40
3	199	.514	344.261	9.4477	9.4302	.19	241.316	247.169	-2.43
3	200	.569	377.594	8.8643	8.8768	-.14	241.316	238.108	1.33
3	201	.396	410.928	8.2710	8.2970	-.31	241.316	236.203	2.12
3	202	.980	444.261	7.7045	7.6953	.12	241.316	242.741	-.59
3	203	.542	477.594	7.0592	7.0903	-.44	241.316	237.438	1.61
3	204	.987	510.928	6.5197	6.5107	.14	241.316	242.295	-.41
3	205	.230	310.928	10.0251	10.0004	.25	258.553	269.413	-4.20
3	206	.750	344.261	9.4933	9.4811	.13	258.553	262.785	-1.64
3	207	.517	377.594	8.9274	8.9420	-.16	258.553	254.632	1.52
3	208	.378	410.928	8.3537	8.3808	-.32	258.553	252.855	2.20
3	209	.958	444.261	7.8004	7.8021	-.02	258.553	258.282	.10
3	210	.343	477.594	7.1731	7.2213	-.67	258.553	252.027	2.52
3	211	.993	510.928	6.6713	6.6633	.12	258.553	259.497	-.36
3	212	.288	310.928	10.0617	10.0393	.22	275.790	285.943	-3.68
3	213	.881	344.261	9.5393	9.5300	.10	275.790	279.155	-1.22
3	214	.501	377.594	8.9886	9.0039	-.17	275.790	271.455	1.57
3	215	.350	410.928	8.4304	8.4595	-.35	275.790	269.290	2.36
3	216	.915	444.261	7.8966	7.9009	-.06	275.790	275.007	.28
3	217	.313	477.594	7.2907	7.3415	-.70	275.790	268.336	2.70
3	218	.997	510.928	6.8097	6.8027	.10	275.790	276.695	-.33
3	219	.323	310.928	10.0986	10.0771	.21	293.027	303.100	-3.44
3	220	.989	344.261	9.5824	9.5770	.06	293.027	295.063	-.69
3	221	.588	377.594	9.0506	9.0628	-.14	293.027	289.377	1.25
3	222	.369	410.928	8.5059	8.5336	-.33	293.027	286.462	2.24
3	223	.903	444.261	7.9881	7.9930	-.06	293.027	292.086	.32
3	224	.310	477.594	7.4024	7.4527	-.68	293.027	285.064	2.72
3	225	.997	510.928	6.9383	6.9311	.10	293.027	294.038	-.34
3	226	.429	310.928	10.1320	10.1136	.18	310.264	319.098	-2.85
3	227	1.000	344.261	9.6259	9.6223	.04	310.264	311.685	-.46
3	228	.605	377.594	9.1074	9.1191	-.13	310.264	306.603	1.18
3	229	.389	410.928	8.5773	8.6036	-.31	310.264	303.684	2.12
3	230	.764	444.261	8.0676	8.0792	-.14	310.264	307.880	.77
3	231	.315	477.594	7.5072	7.5560	-.65	310.264	301.977	2.67
3	232	.990	510.928	7.0592	7.0500	.13	310.264	311.641	-.44
3	233	.514	310.928	10.1656	10.1492	.16	327.501	335.643	-2.49
3	234	.849	344.261	9.6630	9.6659	-.03	327.501	326.334	.36
3	235	.624	377.594	9.1619	9.1731	-.12	327.501	323.867	1.11
3	236	.401	410.928	8.6446	8.6701	-.30	327.501	320.780	2.05
3	237	.658	444.261	8.1439	8.1603	-.20	327.501	323.925	1.09
3	238	.270	477.594	7.5983	7.6526	-.71	327.501	317.673	3.00
3	239	1.000	510.928	7.1656	7.1608	.07	327.501	328.273	-.24
3	240	.727	310.928	10.1957	10.1837	.12	344.738	350.825	-1.77
3	241	.666	344.261	9.7004	9.7082	-.08	344.738	341.540	.93
3	242	.636	377.594	9.2140	9.2248	-.12	344.738	341.065	1.07

44

Table 8. Continued

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
3	243	.439	410.928	8.7102	8.7334	-.27	344.738	338.313	1.86
3	244	.628	444.261	8.2192	8.2370	-.22	344.738	340.657	1.18
3	245	.200	477.594	7.6766	7.7432	-.87	344.738	331.965	3.71
3	246	.962	510.928	7.2619	7.2645	-.04	344.738	344.288	.13

NP = 171, DNRMSPCT = 1.485, PMEANDIF = 1.667, PMEANPCT = .934

45

Table 8. Continued

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
4	247	1.000	294.261	.0287	.0287	.03	.689	.690	-.03
4	248	.999	310.928	.0271	.0271	.07	.689	.690	-.07
4	249	.992	327.594	.0257	.0256	.18	.689	.691	-.18
4	250	.985	344.261	.0244	.0243	.25	.689	.691	-.25
4	251	.984	360.928	.0232	.0232	.26	.689	.691	-.26
4	252	.977	377.594	.0222	.0221	.31	.689	.692	-.31
4	253	.970	394.261	.0213	.0212	.36	.689	.692	-.36
4	254	.996	294.261	.0425	.0425	.13	1.013	1.015	-.13
4	255	.989	310.928	.0401	.0400	.22	1.013	1.015	-.21
4	256	.976	327.594	.0380	.0379	.32	1.013	1.016	-.32
4	257	.965	344.261	.0361	.0359	.39	1.013	1.017	-.39
4	258	.952	360.928	.0343	.0342	.46	1.013	1.018	-.45
4	259	.939	377.594	.0328	.0326	.52	1.013	1.018	-.52
4	260	.929	394.261	.0314	.0312	.56	1.013	1.019	-.56
4	261	.987	294.261	.0584	.0583	.24	1.379	1.382	-.23
4	262	.978	310.928	.0550	.0549	.31	1.379	1.383	-.30
4	263	.956	327.594	.0521	.0518	.44	1.379	1.385	-.44
4	264	.933	344.261	.0494	.0491	.55	1.379	1.386	-.54
4	265	.909	360.928	.0470	.0467	.64	1.379	1.388	-.64
4	266	.889	377.594	.0449	.0446	.72	1.379	1.389	-.71
4	267	.876	394.261	.0429	.0426	.76	1.379	1.389	-.76
4	268	.936	294.261	.0896	.0891	.56	2.068	2.079	-.53
4	269	.924	310.928	.0840	.0835	.60	2.068	2.080	-.58
4	270	.890	327.594	.0793	.0787	.73	2.068	2.083	-.71
4	271	.848	344.261	.0751	.0745	.88	2.068	2.086	-.86
4	272	.817	360.928	.0714	.0707	.97	2.068	2.088	-.96
4	273	.786	377.594	.0680	.0673	1.06	2.068	2.090	-1.05
4	274	.762	394.261	.0650	.0643	1.13	2.068	2.092	-1.13
4	275	.833	294.261	.1225	.1214	.97	2.758	2.783	-.90
4	276	.847	310.928	.1143	.1133	.91	2.758	2.782	-.86
4	277	.817	327.594	.1074	.1064	1.00	2.758	2.784	-.95
4	278	.782	344.261	.1015	.1004	1.10	2.758	2.787	-1.07
4	279	.732	360.928	.0963	.0951	1.25	2.758	2.792	-1.22
4	280	.698	377.594	.0917	.0904	1.35	2.758	2.794	-1.33
4	281	.672	394.261	.0875	.0862	1.42	2.758	2.797	-1.41
4	282	.760	310.928	.1460	.1442	1.22	3.447	3.486	-1.13
4	283	.746	327.594	.1366	.1349	1.25	3.447	3.488	-1.17
4	284	.699	344.261	.1288	.1270	1.39	3.447	3.493	-1.32
4	285	.653	360.928	.1219	.1201	1.52	3.447	3.498	-1.47
4	286	.627	377.594	.1158	.1140	1.60	3.447	3.501	-1.55
4	287	.611	394.261	.1104	.1086	1.64	3.447	3.503	-1.61
4	288	.664	310.928	.1793	.1765	1.58	4.137	4.196	-1.43
4	289	.684	327.594	.1669	.1645	1.48	4.137	4.193	-1.37
4	290	.651	344.261	.1568	.1543	1.57	4.137	4.198	-1.47
4	291	.603	360.928	.1482	.1456	1.71	4.137	4.204	-1.63
4	292	.585	377.594	.1405	.1380	1.76	4.137	4.207	-1.70
4	293	.555	394.261	.1337	.1312	1.85	4.137	4.211	-1.80
4	294	.576	327.594	.2315	.2270	1.94	5.516	5.611	-1.72
4	295	.580	344.261	.2156	.2116	1.88	5.516	5.610	-1.71
4	296	.550	360.928	.2026	.1986	1.96	5.516	5.616	-1.82
4	297	.530	377.594	.1913	.1875	2.01	5.516	5.621	-1.90
4	298	.502	394.261	.1816	.1778	2.10	5.516	5.626	-2.01
4	299	.510	327.534	.3021	.2951	2.33	6.895	7.030	-1.96
4	300	.530	344.261	.2787	.2727	2.16	6.895	7.025	-1.89
4	301	.524	360.928	.2600	.2545	2.12	6.895	7.027	-1.92

Table 8. Continued

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

IO	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
4	302	.512	377.594	.2444	.2392	2.13	6.895	7.030	-1.97
4	303	.486	394.261	.2311	.2260	2.21	6.895	7.038	-2.07
4	304	.508	344.261	.3646	.3559	2.39	8.618	8.789	-1.98
4	305	.507	360.928	.3368	.3291	2.29	8.618	8.789	-1.98
4	306	.510	377.594	.3142	.3072	2.22	8.618	8.789	-1.98
4	307	.488	394.261	.2956	.2889	2.26	8.618	8.796	-2.07
4	308	.522	344.261	.4606	.4491	2.50	10.342	10.540	-1.92
4	309	.506	360.928	.4203	.4101	2.42	10.342	10.548	-1.99
4	310	.521	377.594	.3886	.3799	2.26	10.342	10.542	-1.93
4	311	.513	394.261	.3633	.3553	2.22	10.342	10.546	-1.97
4	312	.563	360.928	.5112	.4994	2.30	12.066	12.279	-1.77
4	313	.567	377.594	.4681	.4580	2.15	12.066	12.279	-1.76
4	314	.609	394.261	.4337	.4254	1.90	12.066	12.261	-1.62
4	315	.678	360.928	.6117	.5998	1.96	13.790	13.980	-1.38
4	316	.632	377.594	.5537	.5427	1.99	13.790	14.002	-1.54
4	317	.564	394.261	.5111	.5001	2.16	13.790	14.035	-1.78
4	318	.826	360.928	.7264	.7158	1.45	15.513	15.656	-.92
4	319	.682	377.594	.6481	.6359	1.89	15.513	15.727	-1.38
4	320	.601	394.261	.5924	.5800	2.09	15.513	15.769	-1.65
4	321	.000	294.261	9.6766	9.6092	.70	17.237	36.412	-111.24
4	322	.001	310.928	9.2916	9.2465	.49	17.237	27.468	-59.36
4	323	.002	327.594	8.8900	8.8483	.47	17.237	24.560	-42.49
4	324	.004	344.261	8.4407	8.3967	.52	17.237	22.904	-32.88
4	325	.037	360.928	7.8762	7.8549	.27	17.237	19.013	-10.30
4	326	.686	377.594	.7552	.7400	2.02	17.237	17.472	-1.36
4	327	.616	394.261	.6808	.6663	2.13	17.237	17.513	-1.60
4	328	.705	377.594	.8780	.8593	2.13	18.961	19.207	-1.30
4	329	.605	394.261	.7783	.7604	2.30	18.961	19.271	-1.64
4	330	.773	377.594	1.0222	1.0013	2.05	20.684	20.909	-1.09
4	331	.609	394.261	.8859	.8643	2.44	20.684	21.020	-1.62
4	332	.730	394.261	1.1407	1.1152	2.23	24.132	24.429	-1.23
4	333	.989	394.261	1.4737	1.4815	-.53	27.579	27.523	.20
4	334	.001	294.261	9.7347	9.6700	.66	34.474	53.952	-56.50
4	335	.004	310.928	9.3674	9.3214	.49	34.474	45.694	-32.55
4	336	.007	327.594	8.9886	8.9438	.50	34.474	43.147	-25.16
4	337	.010	344.261	8.5720	8.5247	.55	34.474	41.453	-20.25
4	338	.219	360.928	8.0558	8.0424	.17	34.474	35.854	-4.00
4	339	.061	377.594	7.4929	7.4505	.57	34.474	37.238	-8.02
4	340	.051	394.261	6.7021	6.5999	1.53	34.474	37.458	-8.66
4	341	.003	294.261	9.7935	9.7275	.67	51.711	72.692	-40.57
4	342	.008	310.928	9.4380	9.3913	.50	51.711	63.893	-23.56
4	343	.012	327.594	9.0774	9.0309	.51	51.711	61.5i3	-18.96
4	344	.020	344.261	8.6827	8.6376	.52	51.711	59.176	-14.44
4	345	.118	360.928	8.2217	8.1972	.30	51.711	54.702	-5.79
4	346	.078	377.594	7.7283	7.6854	.55	51.711	55.394	-7.12
4	347	.101	394.261	7.1120	7.0520	.84	51.711	54.874	-6.12
4	348	.004	294.261	9.8460	9.7820	.65	68.948	90.287	-30.95
4	349	.012	310.928	9.5031	9.4568	.49	68.948	81.777	-18.61
4	350	.017	327.594	9.1588	9.1113	.52	68.948	79.791	-15.73
4	351	.036	344.261	8.7795	8.7389	.46	68.948	76.352	-10.74
4	352	.206	360.928	8.3512	8.3302	.25	68.948	71.885	-4.26
4	353	.110	377.594	7.9102	7.8707	.50	68.948	73.073	-5.98
4	354	.129	394.261	7.3885	7.3371	.69	68.948	72.686	-5.42
4	355	.007	294.261	9.8955	9.8340	.62	86.184	107.660	-24.92
4	356	.016	310.928	9.5658	9.5186	.49	86.184	100.038	-16.07
4	357	.028	327.594	9.2294	9.1859	.47	86.184	96.792	-12.31

47

Table 8.   Continued

I-BUTANE PVT DATA VS. EQUATION OF STATE.
(1)VIRIAL, (2)BEATTIE, (3)MORRIS, (4)SAGE/LACEY.

ID	PN	WT	T,K	MOL/L	CALCD	D,PCT	P,BAR	CALCD	P,PCT
4	358	.052	344.261	8.8700	8.8311	.44	86.184	93.908	-8.96
4	359	.136	360.928	8.4771	8.4475	.35	86.184	90.853	-5.42
4	360	.319	377.594	8.0488	8.0258	.29	86.184	88.971	-3.23
4	361	.182	394.261	7.5962	7.5535	.56	86.184	90.070	-4.51
4	362	.008	294.261	9.9491	9.8836	.66	103.421	127.350	-23.14
4	363	.023	310.928	9.6225	9.5770	.47	103.421	117.501	-13.61
4	364	.052	327.594	9.2916	9.2557	.39	103.421	112.735	-9.01
4	365	.080	344.261	8.9506	8.9159	.39	103.421	110.880	-7.21
4	366	.185	360.928	8.5800	8.5528	.32	103.421	108.168	-4.59
4	367	.495	377.594	8.1777	8.1601	.22	103.421	105.855	-2.35
4	368	.264	394.261	7.7653	7.7305	.45	103.421	107.177	-3.63
4	369	.009	294.261	9.9996	9.9312	.68	120.658	146.791	-21.66
4	370	.026	310.928	9.6800	9.6325	.49	120.658	136.097	-12.80
4	371	.061	327.594	9.3579	9.3213	.39	120.658	130.725	-8.34
4	372	.078	344.261	9.0328	8.9945	.42	120.658	129.507	-7.33
4	373	.226	360.928	8.6745	8.6485	.30	120.658	125.609	-4.10
4	374	.256	377.594	8.3084	8.2791	.35	120.658	125.212	-3.77
4	375	.517	394.261	7.9033	7.8815	.28	120.658	123.364	-2.24
4	376	.009	294.261	10.0507	9.9768	.74	137.895	167.316	-21.34
4	377	.029	310.928	9.7347	9.6854	.51	137.895	154.700	-12.19
4	378	.076	327.594	9.4187	9.3832	.38	137.895	148.186	-7.46
4	379	.098	344.261	9.1044	9.0679	.40	137.895	146.911	-6.54
4	380	.245	360.928	8.7628	8.7365	.30	137.895	143.312	-3.93
4	381	.445	377.594	8.4073	8.3862	.25	137.895	141.488	-2.61
4	382	.626	394.261	8.0323	8.0138	.23	137.895	140.479	-1.87
4	383	.011	294.261	10.0949	10.0207	.74	155.132	185.819	-19.78
4	384	.032	310.928	9.7866	9.7360	.52	155.132	173.167	-11.63
4	385	.089	327.594	9.4770	9.4419	.37	155.132	165.838	-6.90
4	386	.147	344.261	9.1680	9.1367	.34	155.132	163.323	-5.28
4	387	.387	360.928	8.8387	8.8181	.23	155.132	159.691	-2.94
4	388	.515	377.594	8.5032	8.4838	.23	155.132	158.739	-2.33
4	389	.773	394.261	8.1463	8.1320	.18	155.132	157.347	-1.43
4	390	.013	294.261	10.1357	10.0629	.72	172.369	203.553	-18.09
4	391	.035	310.928	9.8355	9.7844	.52	172.369	191.353	-11.01
4	392	.100	327.594	9.5327	9.4978	.37	172.369	183.567	-6.50
4	393	.201	344.261	9.2294	9.2016	.30	172.369	180.056	-4.46
4	394	.380	360.928	8.9159	8.8941	.24	172.369	177.516	-2.99
4	395	.613	377.594	8.5907	8.5737	.20	172.369	175.784	-1.98
4	396	.968	394.261	8.2389	8.2390	-.00	172.369	172.345	.01
4	397	.016	294.261	10.1731	10.1037	.68	189.606	220.346	-16.21
4	398	.047	310.928	9.8778	9.8309	.47	189.606	207.709	-9.55
4	399	.136	327.594	9.5824	9.5511	.33	189.606	200.116	-5.54
4	400	.206	344.261	9.2916	9.2630	.31	189.606	197.943	-4.40
4	401	.443	360.928	8.9856	8.9654	.22	189.606	194.682	-2.68
4	402	.526	377.594	8.6773	8.6571	.23	189.606	193.970	-2.30
4	403	.893	394.261	8.3335	8.3370	-.04	189.606	188.977	.33
4	404	.019	294.261	10.2108	10.1431	.66	206.843	237.804	-14.97
4	405	.042	310.928	9.9276	9.8756	.52	206.843	227.732	-10.10
4	406	.127	327.594	9.6360	9.6020	.35	206.843	218.759	-5.76
4	407	.120	344.261	9.3611	9.3214	.42	206.843	219.049	-5.90
4	408	.443	360.928	9.0535	9.0327	.23	206.843	212.395	-2.68
4	409	.934	377.594	8.7433	8.7349	.10	206.843	208.782	-.94
4	410	.779	394.261	8.4201	8.4274	-.09	206.843	205.400	.70

NP = 164, DNRMSPCT = 1.727, PMEANDIF =   .873, PMEANPCT = 1.461

NP = 246, DNRMSPCT = 1.268, PMEANDIF = 1.189, PMEANPCT = .726

48

Table 9. Comparisons with data for ideal gas functions

I-BUTANE IDEAL GAS FUNCTIONS, JOULES,MOLES,KELVINS

T,K	HZ-HZZ	CALCD	PCNT	SZ	CALCD	PCNT	CPZ	CALCD	PCNT
50.00	1674.4	1660.5	.83	194.012	193.782	.12	34.81	34.80	.04
100.00	3699.1	3704.2	-.14	221.585	221.608	-.01	47.28	47.28	-.01
150.00	6398.4	6399.3	-.01	243.258	243.283	-.01	60.29	60.30	-.01
200.00	9702.7	9704.5	-.02	262.211	262.221	-.00	71.84	71.82	.03
273.15	15603.5	15603.7	-.00	287.190	287.212	-.01	89.91	89.93	-.02
298.15	17936.0	17935.7	.00	295.390	295.377	.00	96.65	96.67	-.02
300.00	18115.0	18115.0	-.00	295.976	295.976	-.00	97.15	97.17	-.02
400.00	29201.0	29201.8	-.00	327.691	327.683	.00	124.43	124.40	.02
500.00	42913.2	42909.0	.01	358.192	358.166	.01	149.24	149.17	.05
600.00	58924.1	58916.2	.01	387.313	387.292	.01	170.37	170.39	-.01
700.00	76881.0	76879.4	.00	414.927	414.947	-.00	188.28	188.38	-.05
800.00	96496.4	96503.8	-.01	441.119	441.129	-.00	203.64	203.71	-.04
900.00	117539.4	117549.7	-.01	465.888	465.902	-.00	216.94	216.89	.02
1000.00	139825.1	139824.3	.00	489.361	489.360	.00	228.45	228.34	.04
1100.00	163182.7	163171.7	.01	511.620	511.605	.00	238.49	238.39	.04
1200.00	187476.7	187463.9	.01	532.749	532.736	.00	247.15	247.28	-.05

Table 10.   Interpolated ideal gas functions

I-BUTANE IDEAL GAS FUNCTIONS, JOULES,MOLES,KELVINS

T,K	EZ-EZZ	HZ-HZZ	SZ	CVZ	CPZ
110.0	3275.8	4190.4	226.239	41.64	49.95
120.0	3705.6	4703.3	230.700	44.32	52.63
130.0	4162.0	5242.9	235.018	46.96	55.27
140.0	4644.5	5808.5	239.208	49.52	57.83
150.0	5152.1	6399.3	243.283	51.98	60.30
160.0	5683.8	7014.2	247.251	54.36	62.67
170.0	6239.0	7652.5	251.120	56.67	64.99
180.0	6817.2	8313.8	254.899	58.95	67.26
190.0	7418.0	8997.7	258.596	61.22	69.53
200.0	8041.6	9704.5	262.221	63.50	71.82
210.0	8688.1	10434.2	265.780	65.82	74.13
220.0	9358.1	11187.3	269.283	68.18	76.50
230.0	10051.9	11964.2	272.737	70.59	78.91
240.0	10770.2	12765.6	276.147	73.06	81.38
250.0	11513.4	13592.0	279.520	75.59	83.90
260.0	12282.1	14443.8	282.861	78.16	86.48
270.0	13076.8	15321.7	286.173	80.78	89.10
280.0	13897.9	16225.9	289.462	83.44	91.76
290.0	14745.8	17157.0	292.728	86.14	94.45
300.0	15620.7	18115.0	295.976	88.86	97.17
310.0	16522.9	19100.4	299.207	91.59	99.91
320.0	17452.6	20113.2	302.422	94.34	102.66
330.0	18409.8	21153.6	305.623	97.10	105.41
340.0	19394.5	22221.4	308.811	99.85	108.16
350.0	20406.8	23316.8	311.986	102.60	110.91
360.0	21446.4	24439.6	315.149	105.33	113.65
370.0	22513.4	25589.7	318.300	108.05	116.37
380.0	23607.4	26766.9	321.439	110.75	119.07
390.0	24728.4	27971.0	324.567	113.43	121.75
400.0	25876.0	29201.8	327.683	116.09	124.40
410.0	27050.0	30459.0	330.787	118.71	127.03
420.0	28250.2	31742.3	333.879	121.31	129.62
430.0	29476.1	33051.4	336.959	123.87	132.19
440.0	30727.5	34385.9	340.027	126.40	134.72
450.0	32004.1	35745.6	343.083	128.90	137.22
460.0	33305.5	37130.1	346.126	131.36	139.68
470.0	34631.3	38539.1	349.156	133.79	142.11
480.0	35981.2	39972.1	352.173	136.18	144.50
490.0	37354.8	41428.9	355.176	138.54	146.85
500.0	38751.8	42909.0	358.166	140.85	149.17
510.0	40171.7	44412.1	361.143	143.14	151.45
520.0	41614.4	45937.9	364.106	145.38	153.70
530.0	43079.3	47485.9	367.054	147.59	155.91
540.0	44566.1	49055.9	369.989	149.76	158.08
550.0	46074.4	50647.4	372.909	151.90	160.22
560.0	47604.0	52260.1	375.815	154.01	162.32
570.0	49154.4	53893.7	378.706	156.07	164.39
580.0	50725.4	55547.8	381.583	158.11	166.42
590.0	52316.5	57222.1	384.445	160.11	168.42
600.0	53927.5	58916.2	387.292	162.08	170.39
610.0	55557.9	60629.8	390.125	164.01	172.33
620.0	57207.6	62362.6	392.942	165.92	174.23
630.0	58876.2	64114.3	395.745	167.79	176.10
640.0	60563.3	65884.6	398.533	169.63	177.94
650.0	62268.7	67673.1	401.306	171.44	179.76
660.0	63992.0	69479.6	404.064	173.22	181.54
670.0	65733.0	71303.7	406.807	174.98	183.29
680.0	67491.4	73145.3	409.535	176.70	185.01
690.0	69266.9	75004.0	412.248	178.40	186.71
700.0	71059.3	76879.4	414.947	180.07	188.38

Table 11. Specific heats for saturated liquid at $T<T_b$

I-BUTANE CSAT, J/MOL/K

   .950800000E+02   .935097117E+02   .293653283E+03
  -.700483251E+03   .635097472E+03 0.

ID	WT	T,K	J/MOL/K	CALCO	PCNT
1	.964	120.000	100.29	100.21	.08
1	.943	130.000	101.59	101.58	.01
1	.920	140.000	103.05	103.19	-.13
1	.895	150.000	104.81	104.95	-.13
1	.867	160.000	106.78	106.80	-.03
1	.836	170.000	108.91	108.71	.19
1	.801	180.000	110.88	110.64	.21
1	.761	190.000	112.72	112.60	.10
1	.717	200.000	114.35	114.59	-.21
1	.665	210.100	116.36	116.65	-.25
1	.607	220.000	118.70	118.83	-.11
1	.538	230.000	121.29	121.20	.08
1	.459	240.000	124.31	123.84	.37
1	.366	250.000	127.11	126.88	.18
1	.264	260.000	129.70	130.42	-.55

NP = 15, RMSPCT =   .18

Table 12. Estimated coexistence data at $T<T_b$

I-BUTANE ESTIM. V.P.,BAR, AND QVAP, KJ/MOL.

TB = 261.40000, PB = 1.01325, DB = .048942
EZB =12391.8, EGB =12136.6, HZB = 14565.2, HGB = 14206.9
SZB = 283.3260, SGB = 282.3403, QB = 21297.0

T,K	100/T	P,EQN	P,BAR	LN(P)	MOL/L	Q,EQN	Q,VAP
113.55	.88067	.33889E-06	.18892E-06	-15.48194	.20010E-07	28.208	28.208
115.00	.86957	.48127E-06	.27523E-06	-15.10568	.28784E-07	28.139	28.138
120.00	.83333	.15070E-05	.93316E-06	-13.88469	.93527E-07	27.901	27.898
125.00	.80000	.42873E-05	.28423E-05	-12.77089	.27348E-06	27.666	27.662
130.00	.76923	.11206E-04	.78778E-05	-11.75146	.72884E-06	27.434	27.429
135.00	.74074	.27169E-04	.20085E-04	-10.81552	.17894E-05	27.204	27.199
140.00	.71429	.61589E-04	.47552E-04	-9.95368	.40852E-05	26.976	26.971
145.00	.68966	.13147E-03	.10538E-03	-9.15797	.87409E-05	26.750	26.745
150.00	.66667	.26585E-03	.22007E-03	-8.42156	.17647E-04	26.526	26.521
155.00	.64516	.51201E-03	.43578E-03	-7.73838	.33818E-04	26.303	26.298
160.00	.62500	.94348E-03	.82241E-03	-7.10327	.61834E-04	26.081	26.076
165.00	.60606	.16702E-02	.14861E-02	-6.51163	.10836E-03	25.859	25.855
170.00	.58824	.28507E-02	.25815E-02	-5.95939	.18273E-03	25.638	25.634
175.00	.57143	.47061E-02	.43261E-02	-5.44309	.29756E-03	25.418	25.414
180.00	.55556	.75357E-02	.70164E-02	-4.95950	.46938E-03	25.197	25.194
185.00	.54054	.11734E-01	.11044E-01	-4.50584	.71922E-03	24.976	24.974
190.00	.52632	.17806E-01	.16915E-01	-4.07955	.10732E-02	24.755	24.754
195.00	.51282	.26389E-01	.25263E-01	-3.67841	.15632E-02	24.532	24.532
200.00	.50000	.38263E-01	.36870E-01	-3.30036	.22267E-02	24.308	24.310
205.00	.48780	.54369E-01	.52675E-01	-2.94362	.31077E-02	24.083	24.086
210.00	.47619	.75822E-01	.73795E-01	-2.60646	.42569E-02	23.856	23.861
215.00	.46512	.10392E+00	.10153E+00	-2.28745	.57314E-02	23.627	23.633
220.00	.45455	.14015E+00	.13736E+00	-1.98517	.75954E-02	23.395	23.402
225.00	.44444	.18620E+00	.18297E+00	-1.69843	.99193E-02	23.160	23.168
230.00	.43478	.24394E+00	.24025E+00	-1.42609	.12781E-01	22.923	22.931
235.00	.42553	.31545E+00	.31127E+00	-1.16709	.16265E-01	22.681	22.688
240.00	.41667	.40299E+00	.39831E+00	-.92052	.20463E-01	22.436	22.440
245.00	.40816	.50899E+00	.50383E+00	-.68551	.25472E-01	22.187	22.186
250.00	.40000	.63607E+00	.63044E+00	-.46134	.31397E-01	21.933	21.925
255.00	.39216	.78699E+00	.78097E+00	-.24722	.38350E-01	21.673	21.656
260.00	.38462	.96467E+00	.95834E+00	-.04255	.46451E-01	21.408	21.377

52

Table 13. The heats of vaporization

I-BUTANE QVAP, E = .450, QTRP = 28.208

(1)ASTON,(2)DANA,(3)DAS/KULCOR,(4)DAS/REED/EUBANK,
(5)HANSON,(6)SAGE/LACEY,(40)THERMALOOPS,(41)CLAPEYRON.

.11726829E+01 -.23924906E+00 -.26501997E-01
0.   0.   0.

ID	WT	T,K	KJ/MOL	CALC	PCNT	RESID.
40	1.000	113.550	28.208	28.208	0.00	I
40	1.000	115.000	28.138	28.139	-.00	.9030E+00
40	.998	120.000	27.898	27.901	-.01	.9105E+00
40	.996	125.000	27.662	27.666	-.01	.9214E+00
40	.995	130.000	27.429	27.434	-.02	.9315E+00
40	.993	135.000	27.199	27.204	-.02	.9415E+00
40	.991	140.000	26.971	26.976	-.02	.9507E+00
40	.989	145.000	26.745	26.750	-.02	.9597E+00
40	.987	150.000	26.521	26.526	-.02	.9686E+00
40	.985	155.000	26.298	26.303	-.02	.9771E+00
40	.983	160.000	26.076	26.081	-.02	.9852E+00
40	.981	165.000	25.855	25.859	-.02	.9932E+00
40	.979	170.000	25.634	25.638	-.02	.1001E+01
40	.977	175.000	25.414	25.418	-.01	.1009E+01
40	.974	180.000	25.194	25.197	-.01	.1016E+01
40	.972	185.000	24.974	24.976	-.01	.1023E+01
40	.969	190.000	24.754	24.755	-.00	.1031E+01
40	.966	195.000	24.532	24.532	-.00	.1037E+01
40	.963	200.000	24.310	24.308	.01	.1044E+01
40	.960	205.000	24.086	24.083	.01	.1051E+01
40	.957	210.000	23.861	23.856	.02	.1058E+01
40	.954	215.000	23.633	23.627	.03	.1064E+01
40	.950	220.000	23.402	23.395	.03	.1070E+01
40	.947	225.000	23.168	23.160	.03	.1075E+01
40	.943	230.000	22.931	22.923	.04	.1081E+01
40	.939	235.000	22.688	22.681	.03	.1086E+01
40	.935	240.000	22.440	22.436	.02	.1091E+01
5	.931	244.261	22.157	22.224	-.30	.1083E+01
40	.930	245.000	22.186	22.187	-.00	.1095E+01
40	.926	250.000	21.925	21.933	-.03	.1098E+01
40	.921	255.000	21.656	21.673	-.08	.1102E+01
5	.920	255.372	21.590	21.654	-.29	.1095E+01
40	.915	260.000	21.377	21.408	-.15	.1104E+01
3	.914	261.320	21.297	21.337	-.19	.1104E+01
4	.914	261.320	21.297	21.337	-.19	.1104E+01
1	.914	261.440	21.295	21.331	-.17	.1105E+01
5	.908	266.483	20.996	21.055	-.28	.1106E+01
2	.904	270.000	20.832	20.859	-.13	.1113E+01
3	.904	270.000	20.820	20.859	-.19	.1112E+01
4	.904	270.000	20.763	20.859	-.43	.1104E+01
5	.894	277.534	20.347	20.424	-.38	.1113E+01
2	.890	280.000	20.246	20.282	-.18	.1120E+01
3	.890	280.000	20.251	20.282	-.15	.1121E+01
4	.890	280.000	20.154	20.282	-.63	.1107E+01
5	.877	288.706	19.665	19.753	-.34	.1122E+01

Table 13. Continued

I-BUTANE QVAP, E = .450, QTRP = 28.208

ID	WT	T,K	KJ/MOL	CALC	PCNT	RESID.
2	.875	290.000	19.627	19.672	-.23	.1127E+01
3	.875	290.000	19.627	19.672	-.23	.1127E+01
4	.875	290.000	19.535	19.672	-.69	.1114E+01
6	.875	290.000	19.573	19.672	-.50	.1119E+01
5	.853	299.817	18.996	19.034	-.20	.1134E+01
2	.857	300.000	18.970	19.022	-.27	.1132E+01
3	.857	300.000	18.970	19.022	-.27	.1132E+01
4	.857	300.000	18.916	19.022	-.56	.1125E+01
6	.857	300.000	19.029	19.022	.04	.1140E+01
4	.837	310.000	18.292	18.327	-.19	.1141E+01
2	.837	310.000	18.234	18.327	-.51	.1133E+01
3	.837	310.000	18.292	18.327	-.19	.1141E+01
6	.837	310.000	18.390	18.327	.29	.1152E+01
5	.834	310.928	18.226	18.260	-.19	.1141E+01
2	.812	320.000	17.405	17.578	-.99	.1129E+01
3	.812	320.000	17.502	17.578	-.43	.1141E+01
4	.812	320.000	17.619	17.578	.23	.1156E+01
6	.812	320.000	17.631	17.578	.30	.1157E+01
5	.806	322.039	17.361	17.418	-.33	.1144E+01
2	.782	330.000	16.535	16.765	-1.37	.1127E+01
3	.782	330.000	16.698	16.765	-.40	.1147E+01
4	.782	330.000	16.857	16.765	.55	.1167E+01
6	.782	330.000	16.815	16.765	.30	.1162E+01
5	.771	333.150	16.415	16.494	-.48	.1147E+01
3	.745	340.000	15.807	15.875	-.43	.1151E+01
4	.745	340.000	16.008	15.875	.84	.1176E+01
6	.745	340.000	15.933	15.875	.37	.1167E+01
5	.727	344.261	15.402	15.467	-.42	.1153E+01
3	.699	350.000	14.857	14.888	-.21	.1159E+01
4	.699	350.000	15.046	14.888	1.06	.1183E+01
6	.699	350.000	14.954	14.888	.44	.1171E+01
5	.668	355.372	14.294	14.309	-.11	.1163E+01
3	.639	360.000	13.782	13.779	.02	.1167E+01
4	.639	360.000	13.929	13.779	1.09	.1185E+01
6	.639	360.000	13.811	13.779	.23	.1170E+01
5	.589	366.433	12.984	12.975	.07	.1169E+01
3	.558	370.000	12.514	12.505	.07	.1170E+01
4	.558	370.000	12.615	12.505	.88	.1183E+01
6	.558	370.000	12.539	12.505	.27	.1173E+01
5	.478	377.594	11.335	11.386	-.45	.1163E+01
3	.448	380.000	10.950	10.995	-.41	.1164E+01
4	.448	380.000	10.973	10.995	-.15	.1168E+01
6	.448	380.000	10.908	10.995	-.79	.1158E+01
4	.376	385.000	10.067	10.112	-.44	.1165E+01
6	.376	385.000	9.891	10.112	-2.18	.1139E+01
5	.316	388.706	9.255	9.376	-1.31	.1153E+01
3	.294	390.000	8.970	9.102	-1.45	.1151E+01
4	.294	390.000	9.017	9.102	-.93	.1158E+01
6	.294	390.000	8.778	9.102	-3.56	.1120E+01
4	.203	395.000	7.807	7.906	-1.26	.1155E+01
5	.127	399.817	6.377	6.460	-1.29	.1155E+01
3	.125	400.000	6.276	6.396	-1.88	.1147E+01
4	.125	400.000	6.397	6.396	.01	.1173E+01
5	.100	405.372	3.891	3.913	-.57	.1166E+01

54

Table 13.   Continued

I-BUTANE QVAP, E = .450, QTRP = 28.208

ID	WT	T,K	KJ/MOL	CALC	PCNT	RESID.
41	1.000	115.000	28.131	28.139	-.02	.8175E+00
41	.996	125.000	27.666	27.666	.00	.9284E+00
41	.992	135.000	27.202	27.204	-.01	.9443E+00
41	.988	145.000	26.742	26.750	-.03	.9581E+00
41	.984	155.000	26.288	26.303	-.06	.9723E+00
41	.979	165.000	25.839	25.359	-.08	.9872E+00
41	.974	175.000	25.396	25.418	-.09	.1002E+01
41	.968	185.000	24.956	24.976	-.08	.1018E+01
41	.962	195.000	24.519	24.532	-.05	.1034E+01
41	.956	205.000	24.084	24.083	.01	.1051E+01
41	.949	215.000	23.651	23.627	.10	.1068E+01
41	.941	225.000	23.218	23.160	.25	.1085E+01
41	.932	235.000	22.778	22.681	.43	.1102E+01
41	.923	245.000	22.326	22.187	.63	.1118E+01
41	.912	255.000	21.851	21.673	.82	.1132E+01
41	.900	265.000	21.344	21.137	.98	.1144E+01
41	.886	275.000	20.796	20.575	1.07	.1153E+01
41	.870	285.000	20.199	19.981	1.09	.1159E+01
41	.852	295.000	19.550	19.352	1.02	.1162E+01
41	.830	305.000	18.846	18.681	.89	.1164E+01
41	.805	315.000	18.086	17.960	.70	.1164E+01
41	.775	325.000	17.268	17.180	.51	.1164E+01
41	.738	335.000	16.387	16.331	.34	.1165E+01
41	.693	345.000	15.433	15.395	.25	.1166E+01
41	.634	355.000	14.393	14.351	.29	.1170E+01
41	.557	365.000	13.240	13.166	.56	.1177E+01
41	.453	375.000	11.926	11.786	1.13	.1189E+01
41	.307	385.000	10.353	10.112	2.33	.1207E+01
41	.115	395.000	8.287	7.906	4.81	.1239E+01
41	.000	405.000	4.724	4.150	13.85	.1347E+01

NP = 129, FMSPCT =   .54

Table 14. Comparisons with data for $C_p(\rho,T)$

COMPARISON WITH ISOBUTANE CP OF SAGE/LACEY

T,K	P,BAR	MOL/L	J/MOL/K	CALC	PCNT
294.261	0.000	0.0000	93.58	95.61	-2.12
310.928	0.000	0.0000	95.96	100.16	-4.19
327.594	0.000	0.0000	98.69	104.75	-5.79
344.261	0.000	0.0000	101.41	109.34	-7.25
360.928	0.000	0.0000	104.40	113.90	-8.34
377.594	0.000	0.0000	107.47	118.42	-9.25
394.261	0.000	0.0000	110.77	122.88	-9.85
294.261	1.013	.0425	94.75	97.05	-2.37
310.928	1.013	.0400	97.16	101.37	-4.16
327.594	1.013	.0379	99.61	105.78	-5.83
344.261	1.013	.0359	102.43	110.22	-7.06
360.928	1.013	.0342	105.35	114.66	-8.12
377.594	1.013	.0326	108.41	119.08	-8.96
394.261	1.013	.0312	111.72	123.46	-9.51
294.261	1.379	.0583	95.84	97.65	-1.85
310.928	1.379	.0549	97.54	101.86	-4.24
327.594	1.379	.0518	100.02	106.18	-5.80
344.261	1.379	.0491	102.80	110.56	-7.02
360.928	1.379	.0467	105.72	114.95	-8.04
377.594	1.379	.0446	108.78	119.33	-8.84
394.261	1.379	.0426	112.09	123.68	-9.37
294.261	2.758	.1214	101.95	100.43	1.51
310.928	2.758	.1133	100.75	104.01	-3.13
327.594	2.758	.1064	102.04	107.92	-5.44
344.261	2.758	.1004	104.38	112.00	-6.80
360.928	2.758	.0951	107.15	116.16	-7.76
377.594	2.758	.0904	110.14	120.36	-8.49
394.261	2.758	.0862	113.45	124.56	-8.92
310.928	4.137	.1765	106.10	106.80	-.65
327.594	4.137	.1645	104.89	110.04	-4.68
344.261	4.137	.1543	106.30	113.68	-6.49
360.928	4.137	.1456	108.73	117.54	-7.50
377.594	4.137	.1380	111.63	121.51	-8.14

Table 14. Continued

COMPARISON WITH ISOBUTANE CP OF SAGE/LACEY

T,K	P,BAR	MOL/L	J/MOL/K	CALC	PCNT
394.261	4.137	.1312	114.91	125.54	-8.47
327.594	5.516	.2270	108.71	112.67	-3.51
344.261	5.516	.2116	108.66	115.67	-6.06
360.928	5.516	.1986	110.46	119.12	-7.27
377.594	5.516	.1875	113.18	122.80	-7.83
394.261	5.516	.1778	116.42	126.61	-8.05
327.594	6.895	.2951	114.11	116.06	-1.69
344.261	6.895	.2727	111.50	118.06	-5.55
360.928	6.895	.2545	112.40	120.93	-7.05
377.594	6.895	.2392	114.84	124.24	-7.57
394.261	6.895	.2260	118.02	127.78	-7.64
344.261	8.618	.3559	115.93	121.86	-4.87
360.928	8.618	.3291	115.15	123.64	-6.87
377.594	8.618	.3072	117.05	126.30	-7.33
394.261	8.618	.2889	120.09	129.42	-7.21
344.261	10.342	.4491	121.52	127.13	-4.41
360.928	10.342	.4101	118.41	127.03	-6.78
377.594	10.342	.3799	119.46	128.74	-7.21
394.261	10.342	.3553	122.28	131.29	-6.86
360.928	12.066	.4994	122.06	131.44	-7.14
377.594	12.066	.4580	122.08	131.68	-7.29
394.261	12.066	.4254	124.59	133.44	-6.63
360.928	13.790	.5998	126.46	137.53	-8.05
377.594	13.790	.5427	125.00	135.33	-7.63
394.261	13.790	.5001	126.99	135.95	-6.59
360.928	15.513	.7159	132.08	146.79	-10.02
377.594	15.513	.6359	128.28	140.00	-8.37
394.261	15.513	.5800	129.52	138.94	-6.78
377.594	17.237	.7400	132.00	146.28	-9.76
394.261	17.237	.6663	132.22	142.57	-7.26
377.594	20.684	1.0013	142.02	170.06	-16.49
394.261	20.684	.8643	138.38	152.89	-9.49
394.261	24.132	1.1152	146.40	171.98	-14.87

NP = 66, RMSPCT = 7.41

Table 15. Comparisons of functions at T = 250 F

COMPARISONS WITH ISOBUTANE FUNCTIONS OF SAGE/LACEY AT T = 250 F,
UNITS, BARS, MOLES, LITERS, JOULES, KELVINS, T = 394.261 K.

P,BAR	MOL/L	CALC	PCNT	(H-H1)	CALC	PCNT	(S-S1)	CALC	PCNT
1.013	.031	.031	.56	0.0	0.0	0.00	0.000	0.000	0.00
1.379	.043	.043	.77	-18.9	-36.4	-48.03	-2.554	-2.628	-2.84
2.758	.087	.086	1.45	-106.7	-179.0	-40.36	-8.390	-8.655	-3.06
4.137	.134	.131	1.89	-218.9	-331.0	-33.88	-11.892	-12.311	-3.40
6.895	.231	.226	2.26	-505.3	-659.9	-23.43	-16.537	-17.174	-3.71
10.342	.363	.355	2.27	-956.6	-1114.5	-14.17	-20.696	-21.402	-3.30
13.790	.511	.500	2.21	-1498.3	-1622.5	-7.65	-24.100	-24.764	-2.68
17.237	.681	.666	2.17	-2117.1	-2198.6	-3.70	-27.140	-27.743	-2.17
20.684	.886	.864	2.50	-2307.5	-2871.3	-2.22	-30.059	-30.604	-1.78
24.132	1.141	1.115	2.28	-3645.2	-3700.2	-1.49	-32.953	-33.602	-1.93
27.579	1.474	1.481	-.52	-4820.6	-4858.2	-.77	-36.600	-37.226	-1.68
34.474	6.702	6.600	1.55	-13378.3	-13958.5	-4.16	-58.877	-60.690	-2.99
51.711	7.112	7.052	.85	-13729.5	-14478.2	-5.17	-60.402	-62.647	-3.58
68.948	7.388	7.337	.70	-13956.5	-14746.8	-5.36	-61.581	-63.936	-3.68
103.421	7.765	7.730	.45	-14202.4	-15018.3	-5.43	-63.354	-65.783	-3.69
137.895	8.032	8.014	.23	-14311.9	-15126.1	-5.38	-64.738	-67.166	-3.62
172.369	8.239	8.239	-.00	-14352.4	-15148.8	-5.26	-65.915	-68.299	-3.49
206.843	8.420	8.427	-.09	-14342.9	-15118.6	-5.13	-66.941	-69.272	-3.36

58

Table 16. Comparisons of functions at T = 440 K

COMPARISONS WITH DAS ET AL (1973) FOR ISOBUTANE AT T = 440 K,
UNITS, BARS, MOLES, LITERS, JOULES, KELVINS.

P,BAR	MOL/L	CALC	PCNT	(H-HZ)	CALC	PCNT	(S-SZ)	CALC	PCNT
1.013	.028	.028	.10	-96.0	-98.7	-2.79	-.156	-.141	11.07
20.265	.663	.660	.45	-2175.8	-2023.0	7.55	-28.539	-28.320	.78
40.530	1.802	1.800	.12	-5402.9	-5193.7	4.03	-40.162	-39.828	.84
60.795	4.433	4.385	1.09	-10630.9	-10333.3	2.88	-53.684	-53.166	.97
81.060	5.742	5.701	.71	-12488.9	-12191.9	2.44	-58.795	-58.286	.87
101.325	6.322	6.270	.83	-13193.1	-12862.8	2.57	-61.155	-60.577	.95
121.590	6.690	6.641	.73	-13570.5	-13236.0	2.53	-62.719	-62.138	.94
141.855	6.961	6.921	.58	-13798.0	-13472.4	2.42	-63.910	-63.354	.88
162.120	7.178	7.148	.41	-13940.7	-13628.9	2.29	-64.885	-64.364	.81
182.385	7.360	7.339	.28	-14029.3	-13732.6	2.16	-65.720	-65.236	.74
202.650	7.517	7.506	.15	-14080.6	-13798.8	2.04	-66.455	-66.006	.68
222.915	7.657	7.653	.06	-14104.6	-13836.5	1.94	-67.116	-66.700	.62
243.180	7.783	7.785	-.02	-14107.9	-13852.3	1.84	-67.720	-67.332	.58
263.445	7.898	7.905	-.09	-14094.8	-13850.5	1.76	-68.277	-67.915	.53
283.710	8.004	8.015	-.13	-14068.7	-13834.2	1.69	-68.797	-68.457	.50
303.975	8.102	8.116	-.17	-14031.8	-13806.0	1.64	-69.285	-68.964	.47
354.638	8.324	8.342	-.21	-13903.5	-13693.9	1.53	-70.393	-70.108	.41
405.300	8.519	8.535	-.19	-13737.2	-13537.4	1.48	-71.381	-71.116	.37

ISOBUTANE, R.D.G. VS. K.E.S. AT T = 200.00 DEG. K
UNITS KELVINS, BARS, G-MOL/LITER, JOULES.
DATA = R.D.G., CALC. = K.E.S.

MOL/L	P,BAR	CALC	PCNT	DP/DD	CALC	PCNT	DP/DT	CALC	PCNT	D2P/DT2	CALC	H-HZ	CALC	PCNT
11.320	2.90	108.83	3656.96	667.08	907.07	35.98	11.390	14.718	29.23	-.00002	-.10949	-24311	-23305	-4.14
11.340	16.36	127.11	676.94	679.33	921.42	35.64	11.487	14.782	28.69	-.00009	-.11015	-24228	-23189	-4.29
11.360	30.07	145.68	384.47	691.75	935.88	35.29	11.585	14.846	28.15	-.00017	-.11081	-24143	-23072	-4.44
11.380	44.03	164.55	273.70	704.36	950.46	34.94	11.684	14.909	27.60	-.00025	-.11147	-24056	-22952	-4.59
11.400	58.25	183.70	215.39	717.16	965.16	34.58	11.784	14.971	27.05	-.00033	-.11212	-23968	-22830	-4.75
11.420	72.72	203.15	179.37	730.15	979.98	34.22	11.885	15.034	26.49	-.00042	-.11277	-23877	-22705	-4.91
11.440	87.45	222.90	154.88	743.33	994.92	33.85	11.987	15.095	25.93	-.00050	-.11341	-23785	-22579	-5.07
11.460	102.45	242.95	137.13	756.71	1009.98	33.47	12.090	15.157	25.37	-.00059	-.11405	-23691	-22450	-5.24
11.480	117.72	263.30	123.66	770.29	1025.16	33.09	12.194	15.218	24.80	-.00068	-.11468	-23595	-22318	-5.41
11.500	133.27	283.96	113.08	784.08	1040.46	32.70	12.299	15.279	24.23	-.00077	-.11531	-23496	-22185	-5.58
11.520	149.09	304.92	104.53	798.07	1055.88	32.30	12.405	15.339	23.65	-.00086	-.11593	-23396	-22049	-5.76
11.540	165.19	326.20	97.47	812.28	1071.43	31.90	12.512	15.399	23.07	-.00095	-.11655	-23294	-21911	-5.94
11.560	181.58	347.78	91.53	826.70	1087.09	31.50	12.620	15.459	22.49	-.00105	-.11716	-23190	-21770	-6.12
11.580	198.26	369.68	86.46	841.34	1102.88	31.09	12.730	15.518	21.90	-.00115	-.11777	-23083	-21627	-6.31
11.600	215.24	391.90	82.08	856.21	1118.79	30.67	12.840	15.576	21.31	-.00124	-.11837	-22975	-21482	-6.50
11.620	232.51	414.43	78.24	871.30	1134.83	30.24	12.951	15.635	20.72	-.00134	-.11897	-22865	-21334	-6.69
11.640	250.09	437.29	74.85	886.63	1150.98	29.82	13.064	15.693	20.12	-.00145	-.11956	-22752	-21184	-6.89
11.660	267.98	460.47	71.83	902.20	1167.27	29.38	13.177	15.750	19.52	-.00155	-.12015	-22637	-21031	-7.09
11.680	286.18	483.98	69.12	918.00	1183.68	28.94	13.292	15.807	18.92	-.00166	-.12073	-22520	-20876	-7.30
11.700	304.70	507.82	66.66	934.05	1200.21	28.49	13.408	15.864	18.32	-.00177	-.12131	-22401	-20718	-7.51
11.720	323.54	531.99	64.43	950.36	1216.87	28.04	13.525	15.920	17.71	-.00188	-.12188	-22279	-20558	-7.72
11.740	342.71	556.50	62.38	966.91	1233.66	27.59	13.643	15.975	17.10	-.00199	-.12244	-22155	-20396	-7.94
11.760	362.22	581.34	60.49	983.73	1250.57	27.13	13.762	16.030	16.48	-.00210	-.12300	-22029	-20231	-8.16
11.780	382.07	606.52	58.75	1000.81	1267.61	26.66	13.883	16.085	15.86	-.00222	-.12356	-21900	-20063	-8.39

Table 17. Comparisons with Starling, et al. on isotherms

Table 17. Continued

ISOBUTANE, R.O.G. VS. K.E.S. AT T = 300.00 DEG. K
UNITS KELVINS, BARS, G-MOL/LITER, JOULES.
DATA = R.O.G., CALC. = K.E.S.

MOL/L	P,BAR	CALC	PCNT	DP/DD	CALC	PCNT	DP/DT	CALC	PCNT	D2P/DT2	CALC	H-HZ	CALC	PCNT
.040	.98	.97	-.15	23.88	23.76	-.49	.003	.003	-.27	-.00000	-.00000	-197	-184	-6.89
.080	1.91	1.90	-.35	22.72	22.59	-.56	.007	.007	-.63	-.00000	-.00000	-378	-367	-2.91
.120	2.79	2.78	-.38	21.49	21.44	-.25	.011	.011	-1.08	-.00001	-.00001	-564	-549	-2.71
.160	3.63	3.62	-.29	20.24	20.30	.29	.015	.015	-1.64	-.00001	-.00001	-754	-729	-3.33
9.440	5.31	16.36	208.00	244.84	273.40	11.66	5.410	5.455	.84	-.00000	-.01457	-19804	-19804	.00
9.480	15.30	27.52	79.87	254.61	284.55	11.76	5.492	5.525	.61	-.00003	-.01492	-19771	-19760	.06
9.520	25.68	39.13	52.35	264.64	295.96	11.83	5.575	5.595	.37	-.00005	-.01527	-19736	-19712	.12
9.560	36.48	51.20	40.37	274.93	307.62	11.89	5.659	5.666	.11	-.00008	-.01562	-19697	-19659	-.19
9.600	47.68	63.74	33.68	285.51	319.56	11.93	5.745	5.736	-.16	-.00011	-.01598	-19654	-19603	-.26
9.640	59.32	76.77	29.42	296.37	331.76	11.94	5.833	5.807	-.44	-.00014	-.01633	-19608	-19542	-.34
9.680	71.40	90.29	26.46	307.51	344.23	11.94	5.922	5.878	-.74	-.00016	-.01669	-19559	-19478	-.42
9.720	83.93	104.31	24.29	318.96	356.98	11.92	6.012	5.949	-1.04	-.00020	-.01704	-19506	-19408	-.50
9.760	96.92	118.85	22.63	330.70	370.01	11.88	6.104	6.020	-1.36	-.00023	-.01740	-19449	-19335	-.59
9.800	110.39	133.92	21.32	342.76	383.31	11.83	6.197	6.092	-1.70	-.00026	-.01775	-19388	-19257	-.68
9.840	124.34	149.52	20.25	355.14	396.90	11.76	6.292	6.163	-2.04	-.00030	-.01811	-19324	-19174	-.78
9.880	138.80	165.67	19.36	367.84	410.77	11.67	6.388	6.235	-2.40	-.00033	-.01846	-19256	-19087	-.88
9.920	153.77	182.39	18.61	380.88	424.93	11.57	6.486	6.307	-2.77	-.00037	-.01882	-19183	-18995	-.98
9.960	169.28	199.67	17.96	394.26	439.38	11.45	6.586	6.378	-3.15	-.00041	-.01917	-19107	-18898	-1.09
10.000	185.32	217.54	17.39	407.99	454.13	11.31	6.687	6.450	-3.54	-.00045	-.01952	-19026	-18796	-1.21
10.040	201.92	236.00	16.88	422.08	469.18	11.16	6.790	6.522	-3.95	-.00049	-.01988	-18941	-18689	-1.33
10.080	219.09	255.08	16.43	436.53	484.53	10.99	6.894	6.594	-4.36	-.00053	-.02023	-18851	-18578	-1.45
10.120	236.85	274.77	16.01	451.37	500.18	10.81	7.001	6.666	-4.79	-.00058	-.02058	-18757	-18461	-1.58
10.160	255.21	295.10	15.63	466.59	516.14	10.62	7.109	6.738	-5.23	-.00062	-.02093	-18658	-18338	-1.72
10.200	274.18	316.07	15.27	482.21	532.41	10.41	7.219	6.809	-5.67	-.00067	-.02128	-18555	-18211	-1.85
10.240	293.79	337.69	14.94	498.23	549.00	10.19	7.331	6.881	-6.13	-.00072	-.02163	-18447	-18078	-2.00
10.280	314.04	359.99	14.63	514.67	565.90	9.95	7.445	6.953	-6.60	-.00077	-.02197	-18333	-17939	-2.15
10.320	334.97	382.97	14.33	531.54	583.12	9.70	7.560	7.025	-7.08	-.00082	-.02232	-18215	-17795	-2.31
10.360	356.57	406.64	14.04	548.85	600.66	9.44	7.678	7.096	-7.57	-.00088	-.02266	-18092	-17646	-2.47
10.400	378.88	431.03	13.76	566.61	618.53	9.16	7.797	7.168	-8.07	-.00093	-.02300	-17963	-17490	-2.63

Table 17. Continued

ISOBUTANE, R.D.G. VS. K.E.S. AT T = 400.00 DEG. K
UNITS KELVINS, BARS, G-MOL/LITER, JOULES.
DATA = R.D.G., CALC. = K.E.S.

MOL/L	P,BAR	CALC	PCNT	DP/DD	CALC	PCNT	DP/DT	CALC	PCNT	D2P/DT2	CALC	H-HZ	CALC	PCNT
.160	5.08	5.05	-.54	30.06	29.88	-.58	.014	.014	-.86	-.00000	-.00000	-541	-539	-.41
.320	9.61	9.57	-.40	26.65	26.68	.13	.030	.030	-1.65	-.00002	-.00001	-1092	-1067	-2.29
.480	13.61	13.60	-.12	23.41	23.65	1.04	.048	.047	-2.42	-.00004	-.00003	-1645	-1584	-3.70
.640	17.11	17.15	.21	20.39	20.80	2.02	.067	.065	-3.16	-.00007	-.00005	-2191	-2089	-4.66
.800	20.15	20.26	.56	17.59	18.12	3.02	.088	.085	-3.88	-.00011	-.00007	-2728	-2582	-5.35
.960	22.76	22.96	.90	15.02	15.62	3.97	.111	.106	-4.57	-.00016	-.00009	-3255	-3064	-5.86
1.120	24.97	25.27	1.21	12.68	13.29	4.81	.135	.128	-5.23	-.00023	-.00012	-3770	-3534	-6.24
1.280	26.82	27.22	1.48	10.56	11.14	5.47	.161	.152	-5.85	-.00032	-.00015	-4272	-3993	-6.54
1.440	28.36	28.84	1.71	8.65	9.16	5.86	.188	.176	-6.45	-.00043	-.00017	-4763	-4440	-6.78
1.600	29.60	30.16	1.88	6.94	7.35	5.87	.217	.201	-7.03	-.00059	-.00020	-5241	-4876	-6.97
1.760	30.59	31.20	2.00	5.43	5.72	5.33	.246	.228	-7.61	-.00083	-.00022	-5707	-5300	-7.13
1.920	31.35	32.00	2.07	4.08	4.25	3.98	.278	.255	-8.24	-.00126	-.00025	-6161	-5713	-7.27
5.920	32.10	31.52	-1.83	9.17	9.09	-.77	1.361	1.375	1.06	.00278	.00019	-13011	-13218	1.59
6.080	33.87	33.21	-1.95	13.05	12.19	-6.53	1.465	1.458	-.47	.00186	.00013	-13233	-13442	1.58
6.240	36.32	35.45	-2.39	17.71	15.93	-10.02	1.574	1.546	-1.78	.00136	.00006	-13449	-13658	1.56
6.400	39.58	38.35	-3.11	23.21	20.40	-12.11	1.688	1.639	-2.92	.00102	.00003	-13659	-13868	1.53
6.560	43.80	42.03	-4.04	29.64	25.71	-13.24	1.808	1.737	-3.90	.00078	-.00003	-13860	-14068	1.50
6.720	49.12	46.63	-5.07	37.04	31.97	-13.69	1.933	1.842	-4.73	.00059	-.00025	-14051	-14259	1.48
6.880	55.71	52.31	-6.09	45.49	39.29	-13.64	2.065	1.952	-5.44	.00044	-.00045	-14231	-14437	1.45
7.040	63.74	59.26	-7.02	55.09	47.80	-13.23	2.202	2.069	-6.04	.00032	-.00063	-14397	-14603	1.43
7.200	73.40	67.68	-7.79	65.92	57.64	-12.57	2.345	2.191	-6.56	.00021	-.00085	-14549	-14754	1.41
7.360	84.90	77.78	-8.38	78.11	68.93	-11.75	2.495	2.320	-7.02	.00013	-.00108	-14683	-14887	1.39
7.520	98.47	89.82	-8.78	91.77	81.82	-10.84	2.652	2.454	-7.44	.00006	-.00135	-14798	-15002	1.38
7.680	114.36	104.06	-9.00	107.07	96.46	-9.91	2.816	2.595	-7.85	-.00001	-.00163	-14892	-15094	1.36
7.840	132.83	120.79	-9.07	124.17	112.98	-9.01	2.989	2.742	-8.27	-.00007	-.00194	-14962	-15162	1.34
8.000	154.20	140.32	-9.00	143.26	131.56	-8.17	3.171	2.895	-8.72	-.00012	-.00227	-15007	-15203	1.31
8.160	178.79	163.00	-8.83	164.55	152.33	-7.43	3.363	3.053	-9.22	-.00017	-.00263	-15022	-15214	1.27
8.320	206.98	189.20	-8.59	188.26	175.47	-6.80	3.566	3.217	-9.78	-.00022	-.00300	-15007	-15191	1.23
8.480	239.18	219.29	-8.32	214.63	201.13	-6.29	3.780	3.386	-10.42	-.00028	-.00340	-14957	-15132	1.18
8.640	275.82	253.70	-8.02	243.93	229.47	-5.93	4.007	3.560	-11.14	-.00033	-.00381	-14868	-15034	1.11
8.800	317.41	292.87	-7.73	276.43	260.68	-5.70	4.247	3.739	-11.95	-.00040	-.00423	-14739	-14892	1.04
8.960	364.47	337.28	-7.46	312.44	294.90	-5.61	4.502	3.923	-12.86	-.00046	-.00467	-14564	-14703	.95

Table 17.   Continued

ISOBUTANE, R.D.G. VS. K.E.S. AT T = 410.00 DEG. K
UNITS KELVINS, BARS, G-MOL/LITER, JOULES.
DATA = R.D.G., CALC. = K.E.S.

MOL/L	P,BAR	CALC	PCNT	DP/DD	CALC	PCNT	DP/DT	CALC	PCNT	D2P/DT2	CALC	PCNT	H-HZ	CALC	PCNT
.160	5.22	5.19	-.55	31.00	30.81	-.61	.014	.014	-.81	-.00000	-.00000	I	-526	-526	.01
.320	9.91	9.87	-.44	27.69	27.70	.02	.030	.030	-1.54	-.00002	-.00001	I	-1061	-1041	-1.88
.480	14.09	14.06	-.19	24.56	24.76	.79	.048	.047	-2.23	-.00003	-.00003	I	-1598	-1546	-3.28
.640	17.78	17.80	.09	21.64	21.99	1.60	.067	.065	-2.88	-.00006	-.00004	I	-2129	-2039	-4.22
.800	21.03	21.11	.38	18.95	19.39	2.35	.087	.084	-3.49	-.00010	-.00006	I	-2650	-2521	-4.87
.960	23.86	24.01	.65	16.47	16.96	2.99	.110	.105	-4.07	-.00014	-.00009	I	-3161	-2992	-5.35
1.120	26.31	26.55	.89	14.22	14.71	3.43	.133	.127	-4.59	-.00020	-.00011	I	-3660	-3452	-5.69
1.280	28.42	28.73	1.09	12.18	12.62	3.59	.158	.150	-5.06	-.00026	-.00014	I	-4147	-3901	-5.93
1.440	30.22	30.59	1.24	10.36	10.71	3.40	.184	.174	-5.46	-.00033	-.00016	I	-4622	-4339	-6.11
1.600	31.74	32.17	1.33	8.72	8.96	2.75	.212	.199	-5.79	-.00042	-.00019	I	-5083	-4766	-6.24
1.760	33.02	33.47	1.36	7.27	7.38	1.53	.240	.226	-6.04	-.00052	-.00021	I	-5532	-5182	-6.32
1.920	34.08	34.54	1.34	5.99	5.97	-.42	.269	.253	-6.19	-.00064	-.00023	I	-5967	-5587	-6.37
2.080	34.95	35.39	1.26	4.88	4.72	-3.30	.299	.280	-6.24	-.00077	-.00024	I	-6390	-5981	-6.39
2.240	35.65	36.05	1.14	3.91	3.62	-7.39	.330	.309	-6.18	-.00093	-.00026	I	-6799	-6365	-6.38
2.400	36.21	36.56	.97	3.08	2.67	-13.15	.360	.339	-5.98	-.00112	-.00027	I	-7196	-6738	-6.35
2.560	36.64	36.92	.75	2.37	1.87	-21.27	.391	.369	-5.64	-.00133	-.00027	I	-7579	-7101	-6.30
2.720	36.97	37.16	.51	1.79	1.20	-32.86	.422	.401	-5.14	-.00156	-.00027	I	-7949	-7454	-6.23
2.880	37.22	37.31	.24	1.32	.66	-49.69	.453	.433	-4.46	-.00197	-.00026	I	-8307	-7798	-6.13
3.040	37.40	37.38	-.05	.95	.24	-74.36	.483	.466	-3.60	-.00202	-.00025	I	-8651	-8131	-6.00
3.200	37.53	37.39	-.36	.68	-.07	-109.58	.513	.500	-2.56	-.00186	-.00023	I	-8982	-8456	-5.86
3.360	37.62	37.36	-.68	.50	-.27	-154.35	.542	.535	-1.35	-.00145	-.00021	I	-9301	-8773	-5.68
3.520	37.69	37.31	-1.01	.40	-.38	-195.83	.571	.571	-.01	-.00083	-.00019	I	-9608	-9081	-5.49
3.680	37.75	37.25	-1.34	.36	-.40	-211.18	.600	.609	1.37	-.00010	-.00016	I	-9903	-9381	-5.27
3.840	37.81	37.19	-1.64	.36	-.33	-191.70	.630	.647	2.72	.00069	-.00012	I	-10186	-9674	-5.03
4.000	37.87	37.15	-1.91	.38	-.18	-146.90	.661	.688	3.99	.00149	-.00008	I	-10461	-9960	-4.79
4.160	37.93	37.14	-2.11	.44	.06	-86.40	.695	.730	5.12	.00218	-.00004	I	-10726	-10239	-4.54
4.320	38.01	37.17	-2.22	.55	.39	-28.80	.730	.774	6.02	.00268	-.00000	I	-10984	-10513	-4.29
4.480	38.12	37.27	-2.23	.76	.83	9.81	.770	.821	6.63	.00291	.00003	I	-11236	-10781	-4.05
4.640	38.26	37.44	-2.14	1.09	1.39	27.38	.813	.869	6.90	.00292	.00007	I	-11482	-11044	-3.82
4.800	38.47	37.72	-1.96	1.60	2.08	30.54	.862	.921	6.80	.00277	.00011	I	-11724	-11301	-3.61
4.960	38.79	38.12	-1.72	2.33	2.95	26.38	.916	.975	6.37	.00253	.00014	I	-11962	-11554	-3.41
5.120	39.24	38.67	-1.44	3.36	4.02	19.46	.977	1.032	5.65	.00226	.00016	I	-12198	-11802	-3.24
5.280	39.88	39.42	-1.16	4.75	5.33	12.17	1.044	1.093	4.69	.00199	.00017	I	-12430	-12046	-3.10
5.440	40.78	40.39	-.95	6.57	6.93	5.53	1.118	1.158	3.57	.00173	.00018	I	-12660	-12284	-2.97
5.600	42.01	41.65	-.85	8.89	8.88	-.06	1.198	1.226	2.36	.00149	.00017	I	-12887	-12518	-2.87
5.760	43.65	43.26	-.91	11.78	11.24	-4.55	1.285	1.299	1.10	.00127	.00015	I	-13111	-12746	-2.78
5.920	45.81	45.28	-1.17	15.32	14.09	-8.01	1.379	1.377	-.14	.00107	.00012	I	-13330	-12969	-2.70
6.080	48.59	47.79	-1.64	19.57	17.50	-10.56	1.478	1.459	-1.33	.00073	.00007	I	-13544	-13185	-2.64
6.240	52.11	50.91	-2.31	24.59	21.56	-12.54	1.584	1.546	-2.44	.00059	.00000	I	-13751	-13394	-2.59
6.400	56.51	54.73	-3.14	30.47	26.37	-13.46	1.697	1.638	-3.44	.00046	-.00009	I	-13951	-13595	-2.55
6.560	61.91	59.39	-4.07	37.25	32.02	-14.03	1.815	1.736	-4.35	.00034	-.00019	I	-14142	-13787	-2.51
6.720	68.48	65.03	-5.03	45.01	38.64	-14.17	1.939	1.839	-5.14	.00024	-.00032	I	-14322	-13968	-2.47
6.880	76.37	71.81	-5.97	53.84	46.32	-13.96	2.069	1.948	-5.84	.00016	-.00047	I	-14490	-14137	-2.44
7.040	85.77	79.92	-6.82	63.82	55.21	-13.49	2.205	2.062	-6.45	.00008	-.00064	I	-14644	-14292	-2.41
7.200	96.86	89.95	-7.55	75.05	65.42	-12.84	2.347	2.183	-6.98	.00001	-.00084	I	-14783	-14431	-2.38
7.360	109.86	100.93	-8.13	87.66	77.08	-12.07	2.496	2.309	-7.48	-.00005	-.00106	I	-14904	-14553	-2.36
7.520	124.99	114.30	-8.55	101.79	90.35	-11.24	2.652	2.441	-7.95	-.00010	-.00130	I	-15005	-14654	-2.34
7.680	142.52	129.93	-8.83	117.59	105.35	-10.41	2.816	2.579	-8.41	-.00016	-.00156	I	-15085	-14734	-2.33
7.840	162.72	148.11	-8.98	135.23	122.24	-9.61	2.988	2.723	-8.88	-.00021	-.00184	I	-15141	-14788	-2.33
8.000	185.90	169.16	-9.01	154.92	141.17	-8.87	3.170	2.872	-9.38	-.00026	-.00214	I	-15170	-14815	-2.34
8.160	212.41	193.40	-8.95	176.85	162.29	-8.23	3.361	3.027	-9.93	-.00031	-.00247	I	-15178	-14814	-2.36
8.320	242.63	221.22	-8.82	201.26	185.76	-7.70	3.563	3.188	-10.54	-.00037	-.00281	I	-15138	-14774	-2.40
8.480	276.96	252.98	-8.66	228.39	211.74	-7.29	3.777	3.353	-11.22	-.00043	-.00317	I	-15070	-14700	-2.46
8.640	315.87	289.12	-8.47	258.50	240.39	-7.00	4.003	3.523	-11.98	-.00049	-.00354	I	-14964	-14586	-2.53
8.800	359.85	330.06	-8.28	291.88	271.88	-6.85	4.243	3.698	-12.83	-.00055	-.00393	I	-14815	-14428	-2.62

Table 17. Continued

ISOBUTANE, R.D.G. VS. K.E.S. AT T = 450.00 DEG. K
UNITS KELVINS, BARS, G-MOL/LITER, JOULES.
DATA = R.D.G., CALC. = K.E.S.

MOL/L	P,BAR	CALC	PCNT	DP/DD	CALC	PCNT	DP/DT	CALC	PCNT	D2P/DT2	CALC	H-HZ	CALC	PCNT
.160	5.78	5.75	-.56	34.72	34.48	-.69	.014	.014	-.63	-.00000	-.00000	-471	-480	1.81
.320	11.10	11.04	-.54	31.80	31.71	-.29	.030	.029	-1.15	-.00000	-.00000	-952	-950	-.15
.480	15.97	15.90	-.39	29.05	29.09	.16	.046	.046	-1.61	-.00002	-.00002	-1434	-1411	-1.59
.640	20.41	20.36	-.23	26.49	26.63	.55	.065	.063	-2.02	-.00004	-.00003	-1911	-1863	-2.51
.800	24.46	24.44	-.08	24.14	24.34	.82	.084	.082	-2.38	-.00007	-.00005	-2380	-2306	-3.11
.960	28.14	28.16	.05	22.00	22.20	.92	.105	.102	-2.69	-.00009	-.00006	-2838	-2738	-3.52
1.120	31.51	31.55	.14	20.06	20.23	.81	.127	.123	-2.95	-.00012	-.00008	-3286	-3162	-3.78
1.280	34.57	34.64	.18	18.32	18.41	.48	.150	.145	-3.14	-.00016	-.00010	-3722	-3576	-3.94
1.440	37.38	37.45	.19	16.77	16.76	-.06	.174	.169	-3.27	-.00019	-.00012	-4148	-3980	-4.03
1.600	39.95	40.01	.15	15.38	15.26	-.75	.200	.193	-3.34	-.00023	-.00014	-4561	-4375	-4.07
1.760	42.31	42.34	.08	14.15	13.93	-1.54	.226	.218	-3.33	-.00026	-.00015	-4963	-4761	-4.07
1.920	44.48	44.47	-.02	13.05	12.75	-2.32	.253	.245	-3.25	-.00029	-.00017	-5354	-5137	-4.04
2.080	46.49	46.43	-.13	12.09	11.73	-3.00	.281	.272	-3.10	-.00032	-.00018	-5733	-5504	-3.99
2.240	48.36	48.24	-.25	11.25	10.86	-3.44	.309	.300	-2.86	-.00034	-.00019	-6102	-5862	-3.93
2.400	50.10	49.91	-.37	10.52	10.14	-3.55	.338	.330	-2.56	-.00035	-.00020	-6460	-6211	-3.85
2.560	51.73	51.49	-.46	9.89	9.57	-3.22	.368	.360	-2.18	-.00036	-.00021	-6807	-6551	-3.76
2.720	53.27	52.98	-.53	9.36	9.14	-2.41	.398	.391	-1.74	-.00036	-.00021	-7144	-6882	-3.67
2.880	54.73	54.42	-.57	8.95	8.84	-1.14	.429	.423	-1.24	-.00034	-.00021	-7471	-7204	-3.57
3.040	56.14	55.82	-.56	8.64	8.68	.47	.460	.457	-.69	-.00032	-.00021	-7789	-7519	-3.47
3.200	57.50	57.21	-.52	8.46	8.65	2.25	.492	.491	-.12	-.00028	-.00020	-8097	-7825	-3.36
3.360	58.85	58.59	-.43	8.40	8.74	3.95	.524	.527	.47	-.00023	-.00019	-8396	-8123	-3.25
3.520	60.20	60.01	-.32	8.49	8.95	5.38	.558	.564	1.04	-.00017	-.00017	-8686	-8414	-3.13
3.680	61.57	61.46	-.18	8.71	9.28	6.46	.593	.602	1.59	-.00010	-.00016	-8967	-8697	-3.01
3.840	62.99	62.98	-.02	9.06	9.73	7.33	.629	.642	2.08	-.00003	-.00014	-9240	-8973	-2.89
4.000	64.48	64.58	.16	9.53	10.30	8.13	.667	.684	2.51	.00006	-.00011	-9506	-9243	-2.77
4.160	66.05	66.29	.36	10.14	11.01	8.54	.707	.727	2.83	.00014	-.00009	-9765	-9506	-2.64
4.320	67.74	68.11	.56	10.95	11.86	8.27	.750	.773	3.04	.00022	-.00007	-10016	-9764	-2.53
4.480	69.57	70.09	.75	11.99	12.86	7.22	.795	.820	3.12	.00031	-.00005	-10262	-10015	-2.41
4.640	71.59	72.24	.91	13.31	14.03	5.45	.844	.870	3.05	.00038	-.00003	-10501	-10260	-2.30
4.800	73.84	74.59	1.01	14.94	15.41	3.12	.897	.922	2.81	.00045	-.00001	-10735	-10500	-2.19
4.960	76.39	77.18	1.04	16.93	17.01	.43	.954	.977	2.42	.00051	-.00001	-10962	-10734	-2.09
5.120	79.28	80.05	.96	19.33	18.87	-2.38	1.016	1.035	1.89	.00055	-.00002	-11184	-10962	-1.98
5.280	82.60	83.23	.77	22.17	21.03	-5.12	1.083	1.097	1.22	.00057	-.00002	-11400	-11185	-1.89
5.440	86.40	86.80	.45	25.51	23.55	-7.66	1.156	1.161	.45	.00058	-.00001	-11609	-11401	-1.79
5.600	90.79	90.79	-.01	29.38	26.48	-9.88	1.235	1.230	-.40	.00057	-.00001	-11812	-11611	-1.70
5.760	95.84	95.30	-.57	33.85	29.88	-11.74	1.319	1.302	-1.31	.00054	-.00004	-12008	-11814	-1.61
5.920	101.65	100.38	-1.25	38.96	33.81	-13.21	1.409	1.378	-2.23	.00050	-.00009	-12196	-12010	-1.53
6.080	108.34	106.15	-2.03	44.76	38.37	-14.29	1.505	1.458	-3.15	.00045	-.00014	-12376	-12197	-1.45
6.240	116.02	112.70	-2.86	51.33	43.62	-15.02	1.608	1.543	-4.05	.00039	-.00021	-12547	-12375	-1.36
6.400	124.81	120.15	-3.74	58.71	49.66	-15.42	1.716	1.632	-4.91	.00033	-.00026	-12707	-12544	-1.29
6.560	134.86	128.64	-4.61	67.00	56.59	-15.54	1.830	1.726	-5.72	.00026	-.00031	-12856	-12700	-1.21
6.720	146.30	138.31	-5.46	76.27	64.51	-15.43	1.951	1.825	-6.48	.00019	-.00038	-12992	-12845	-1.14
6.880	159.32	149.34	-6.27	86.63	73.53	-15.13	2.077	1.928	-7.18	.00012	-.00049	-13114	-12974	-1.07
7.040	174.09	161.90	-7.00	98.20	83.76	-14.70	2.210	2.037	-7.84	.00006	-.00062	-13221	-13089	-1.00
7.200	190.81	176.21	-7.65	111.09	95.33	-14.19	2.350	2.151	-8.47	.00000	-.00076	-13310	-13185	-.94
7.360	209.72	192.49	-8.22	125.46	108.37	-13.63	2.496	2.270	-9.07	-.00006	-.00091	-13379	-13262	-.88
7.520	231.05	210.97	-8.69	141.48	122.99	-13.06	2.650	2.394	-9.67	-.00011	-.00109	-13427	-13316	-.82
7.680	255.09	231.94	-9.08	159.31	139.35	-12.53	2.812	2.523	-10.27	-.00016	-.00127	-13451	-13347	-.77
7.840	282.14	255.66	-9.38	179.16	157.58	-12.05	2.982	2.657	-10.89	-.00021	-.00147	-13449	-13351	-.73
8.000	312.54	282.47	-9.62	201.22	177.82	-11.63	3.161	2.796	-11.55	-.00026	-.00169	-13417	-13325	-.69
8.160	346.66	312.68	-9.80	225.74	200.21	-11.31	3.351	2.940	-12.25	-.00031	-.00192	-13354	-13268	-.65
8.320	384.91	346.66	-9.94	252.93	224.92	-11.07	3.551	3.089	-13.00	-.00036	-.00216	-13256	-13175	-.61

Table 17. Continued

ISOBUTANE, R.O.G. VS. K.E.S. AT T = 500.00 DEG. K
UNITS KELVINS, BARS, G-MOL/LITER. JOULES.
DATA = R.D.G., CALC. = K.E.S.

MOL/L	P,BAR	CALC	PCNT	DP/DD	CALC	PCNT	DP/DT	CALC	PCNT	D2P/DT2	CALC	H-HZ	CALC	PCNT
.160	6.48	6.44	-.56	39.30	39.01	-.72	.014	.014	-.46	-.00000	-.00000	-415	-433	4.24
.320	12.57	12.49	-.59	36.78	36.60	-.48	.029	.029	-.80	-.00001	-.00001	-841	-858	2.06
.480	18.26	18.17	-.51	34.42	34.35	-.21	.045	.045	-1.08	-.00002	-.00001	-1270	-1276	.49
.640	23.59	23.49	-.42	32.25	32.25	-.02	.063	.062	-1.30	-.00003	-.00002	-1693	-1685	-.49
.800	28.59	28.49	-.34	30.28	30.30	.06	.081	.080	-1.49	-.00006	-.00003	-2110	-2086	-1.12
.960	33.29	33.20	-.29	28.51	28.51	.00	.101	.100	-1.64	-.00008	-.00004	-2518	-2479	-1.52
1.120	37.72	37.62	-.26	26.92	26.87	-.20	.122	.120	-1.75	-.00010	-.00006	-2916	-2864	-1.77
1.280	41.92	41.80	-.27	25.52	25.39	-.52	.144	.141	-1.81	-.00012	-.00007	-3304	-3241	-1.92
1.440	45.90	45.76	-.31	24.28	24.06	-.91	.167	.164	-1.84	-.00014	-.00008	-3683	-3610	-1.99
1.600	49.70	49.51	-.37	23.20	22.89	-1.32	.191	.187	-1.83	-.00016	-.00010	-4052	-3971	-2.02
1.760	53.33	53.09	-.45	22.25	21.88	-1.68	.216	.212	-1.77	-.00018	-.00011	-4412	-4323	-2.01
1.920	56.82	56.52	-.53	21.43	21.02	-1.91	.242	.238	-1.67	-.00019	-.00012	-4762	-4667	-1.99
2.080	60.19	59.83	-.61	20.72	20.32	-1.94	.268	.264	-1.54	-.00020	-.00013	-5103	-5004	-1.95
2.240	63.46	63.03	-.67	20.12	19.77	-1.72	.296	.292	-1.36	-.00021	-.00014	-5436	-5332	-1.90
2.400	66.64	66.16	-.71	19.62	19.38	-1.21	.325	.321	-1.15	-.00021	-.00015	-5760	-5652	-1.86
2.560	69.74	69.24	-.72	19.22	19.14	-.41	.354	.351	-.90	-.00021	-.00015	-6076	-5965	-1.82
2.720	72.79	72.29	-.68	18.92	19.05	.65	.384	.382	-.63	-.00019	-.00016	-6384	-6270	-1.78
2.880	75.81	75.34	-.61	18.75	19.11	1.92	.416	.414	-.34	-.00017	-.00016	-6684	-6567	-1.75
3.040	78.80	78.42	-.49	18.70	19.31	3.26	.448	.448	-.03	-.00014	-.00016	-6977	-6856	-1.73
3.200	81.80	81.53	-.32	18.81	19.67	4.55	.481	.482	.27	-.00011	-.00016	-7262	-7138	-1.70
3.360	84.83	84.72	-.13	19.10	20.17	5.62	.515	.518	.57	-.00007	-.00015	-7540	-7413	-1.68
3.520	87.92	88.00	.09	19.57	20.82	6.37	.551	.556	.84	-.00005	-.00014	-7811	-7681	-1.66
3.680	91.10	91.39	.31	20.25	21.62	6.76	.589	.595	1.08	-.00003	-.00014	-8074	-7942	-1.64
3.840	94.41	94.90	.54	21.14	22.59	6.85	.628	.636	1.27	-.00001	-.00013	-8330	-8196	-1.61
4.000	97.88	98.63	.76	22.22	23.71	6.68	.669	.678	1.41	-.00000	-.00012	-8579	-8443	-1.58
4.160	101.54	102.52	.97	23.57	25.01	6.12	.712	.722	1.47	.00001	-.00010	-8821	-8684	-1.55
4.320	105.44	106.64	1.14	25.22	26.50	5.07	.757	.768	1.45	.00005	-.00009	-9055	-8919	-1.51
4.480	109.63	111.01	1.26	27.23	28.19	3.54	.806	.817	1.34	.00010	-.00008	-9283	-9147	-1.47
4.640	114.17	115.67	1.32	29.64	30.12	1.59	.858	.867	1.12	.00014	-.00007	-9503	-9368	-1.42
4.800	119.14	120.66	1.28	32.50	32.29	-.65	.913	.920	.80	.00018	-.00007	-9716	-9583	-1.36
4.960	124.60	126.02	1.14	35.85	34.75	-3.05	.972	.976	.38	.00022	-.00006	-9920	-9792	-1.29
5.120	130.64	131.80	.89	39.71	37.54	-5.47	1.036	1.034	-.14	.00025	-.00006	-10116	-9994	-1.21
5.280	137.33	138.05	.52	44.11	40.68	-7.78	1.104	1.095	-.75	.00028	-.00007	-10304	-10188	-1.12
5.440	144.78	144.84	.04	49.10	44.24	-9.89	1.177	1.160	-1.43	.00029	-.00007	-10482	-10376	-1.02
5.600	153.08	152.23	-.55	54.69	48.27	-11.74	1.255	1.227	-2.17	.00028	-.00008	-10651	-10555	-.90
5.760	162.32	160.31	-1.23	60.92	52.82	-13.28	1.338	1.299	-2.95	.00026	-.00009	-10810	-10726	-.78
5.920	172.61	169.17	-1.99	67.82	57.97	-14.52	1.427	1.373	-3.75	.00024	-.00012	-10958	-10887	-.64
6.080	184.06	178.90	-2.80	75.44	63.79	-15.44	1.521	1.452	-4.56	.00021	-.00015	-11094	-11039	-.50
6.240	196.79	189.62	-3.64	83.83	70.36	-16.07	1.621	1.534	-5.37	.00017	-.00019	-11219	-11180	-.35
6.400	210.93	201.46	-4.49	93.06	77.75	-16.44	1.727	1.620	-6.16	.00012	-.00024	-11330	-11308	-.19
6.560	226.61	214.55	-5.32	103.21	86.08	-16.60	1.838	1.711	-6.94	.00008	-.00030	-11428	-11423	-.04
6.720	244.01	229.06	-6.13	114.38	95.42	-16.57	1.956	1.806	-7.68	.00003	-.00036	-11510	-11524	.12
6.880	263.28	245.15	-6.89	126.70	105.90	-16.42	2.080	1.905	-8.41	-.00002	-.00044	-11575	-11608	.28
7.040	284.62	263.01	-7.59	140.29	117.61	-16.17	2.210	2.008	-9.12	-.00007	-.00053	-11623	-11675	.45
7.200	308.25	282.86	-8.24	155.31	130.67	-15.87	2.347	2.116	-9.82	-.00011	-.00062	-11650	-11721	.61
7.360	334.40	304.90	-8.82	171.94	145.20	-15.55	2.490	2.229	-10.51	-.00016	-.00073	-11656	-11746	.77
7.520	363.36	329.40	-9.35	190.36	161.32	-15.26	2.642	2.346	-11.21	-.00021	-.00085	-11638	-11748	.94
7.680	395.42	356.62	-9.81	210.77	179.16	-15.00	2.801	2.467	-11.93	-.00025	-.00097	-11593	-11723	1.12

TABLE 18. Calculated P(T) isochores

The following pages give P(T) along isochores, as computed by the equation of state. The third column DP/DD is the isotherm slope $(\partial P/\partial \rho)$ in units of the bar and mol/L. The last two columns give the isochore slopes and curvatures $\partial P/\partial T$, $\partial^2 P/\partial T^2$, in units of the bar and K.

These tables show that the isochore curvatures are qualitatively consistent with a maximum in the specific heat $C_V(\rho,T)$ at the critical point.

Table 18. Calculated P(T) isochores

ISOBUTANE ISOCHORE AT   .500 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
344.238	11.193	16.111	.0536	-.00010
346.000	11.287	16.345	.0535	-.00009
354.000	11.712	17.390	.0528	-.00008
362.000	12.132	18.410	.0522	-.00007
370.000	12.548	19.409	.0517	-.C0006
378.000	12.960	20.391	.0513	-.00005
386.000	13.369	21.358	.0509	-.00005
394.000	13.775	22.313	.0505	-.00004
402.000	14.177	23.256	.0502	-.00004
410.000	14.578	24.187	.0499	-.00004
418.000	14.975	25.110	.0496	-.00004
426.000	15.371	26.023	.0493	-.00003
434.000	15.764	26.928	.0491	-.00003
442.000	16.156	27.825	.0488	-.00003
450.000	16.545	28.715	.0486	-.00003
458.000	16.933	29.598	.0484	-.00003
466.000	17.320	30.475	.0482	-.00002
474.000	17.704	31.346	.0480	-.C0002
482.000	18.088	32.211	.0478	-.00002
490.000	18.470	33.072	.0477	-.00002
498.000	18.851	33.927	.0475	-.C0002
506.000	19.230	34.779	.0474	-.00002
514.000	19.609	35.625	.0472	-.00002
522.000	19.986	36.468	.0471	-.C0002
530.000	20.363	37.307	.0470	-.00001
538.000	20.738	38.143	.0469	-.00001
546.000	21.113	38.975	.0468	-.00001
554.000	21.487	39.804	.0467	-.00001
562.000	21.860	40.630	.0466	-.00001
570.000	22.232	41.453	.0465	-.C0001
578.000	22.604	42.274	.0464	-.00001
586.000	22.975	43.092	.0463	-.00001
594.000	23.345	43.908	.0463	-.C0001
602.000	23.715	44.721	.0462	-.00001
610.000	24.084	45.533	.0461	-.C0001
618.000	24.453	46.342	.0461	-.00001
626.000	24.821	47.149	.0460	-.00001
634.000	25.189	47.955	.0459	-.00001
642.000	25.556	48.759	.0459	-.00001
650.000	25.923	49.561	.0458	-.00001
658.000	26.289	50.362	.0458	-.00001
666.000	26.655	51.162	.0457	-.00001
674.000	27.021	51.960	.0457	-.00001
682.000	27.386	52.756	.0456	-.00001
690.000	27.751	53.552	.0456	-.00000
698.000	28.116	54.346	.0456	-.00000

Table 18. Continued

ISOBUTANE ISOCHORE AT 1.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
374.282	20.264	10.405	.1232	-.00036
378.000	20.720	11.016	.1220	-.00030
386.000	21.687	12.286	.1199	-.00023
394.000	22.638	13.515	.1181	-.00020
402.000	23.573	14.714	.1167	-.00017
410.000	24.506	15.888	.1154	-.00015
418.000	25.424	17.042	.1142	-.00014
426.000	26.333	18.178	.1131	-.00013
434.000	27.234	19.298	.1121	-.00012
442.000	28.127	20.404	.1112	-.00011
450.000	29.013	21.497	.1104	-.00010
458.000	29.893	22.578	.1096	-.00009
466.000	30.767	23.649	.1089	-.00009
474.000	31.636	24.709	.1082	-.00008
482.000	32.499	25.760	.1076	-.00008
490.000	33.357	26.802	.1070	-.00007
498.000	34.211	27.836	.1064	-.00007
506.000	35.061	28.863	.1059	-.00006
514.000	35.906	29.882	.1054	-.00006
522.000	36.748	30.895	.1050	-.00006
530.000	37.586	31.902	.1046	-.00005
538.000	38.421	32.903	.1042	-.00005
546.000	39.252	33.898	.1038	-.00005
554.000	40.081	34.888	.1034	-.00004
562.000	40.907	35.874	.1031	-.00004
570.000	41.730	36.854	.1028	-.00004
578.000	42.551	37.831	.1024	-.00004
586.000	43.370	38.803	.1022	-.00003
594.000	44.186	39.771	.1019	-.00003
602.000	45.000	40.736	.1016	-.00003
610.000	45.812	41.698	.1014	-.00003
618.000	46.622	42.656	.1012	-.00003
626.000	47.431	43.611	.1010	-.00003
634.000	48.238	44.563	.1007	-.00003
642.000	49.043	45.512	.1006	-.00002
650.000	49.846	46.459	.1004	-.00002
658.000	50.649	47.403	.1002	-.00002
666.000	51.449	48.344	.1000	-.00002
674.000	52.249	49.284	.0999	-.00002
682.000	53.047	50.221	.0997	-.00002
690.000	53.844	51.157	.0996	-.00002
698.000	54.641	52.090	.0994	-.00002

Table 18. Continued

ISOBUTANE ISOCHORE AT 2.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
399.151	31.402	3.293	.2957	-.00198
402.000	32.238	3.881	.2914	-.00124
410.000	34.537	5.417	.2841	-.00070
418.000	36.789	6.891	.2793	-.00053
426.000	39.008	8.334	.2754	-.00044
434.000	41.198	9.757	.2721	-.00038
442.000	43.363	11.164	.2693	-.00034
450.000	45.507	12.558	.2667	-.00030
458.000	47.631	13.941	.2644	-.00028
466.000	49.738	15.314	.2623	-.00025
474.000	51.828	16.678	.2603	-.00023
482.000	53.903	18.035	.2585	-.00022
490.000	55.964	19.385	.2568	-.00020
498.000	58.012	20.728	.2553	-.00019
506.000	60.049	22.065	.2538	-.00018
514.000	62.073	23.396	.2524	-.00016
522.000	64.088	24.723	.2512	-.00015
530.000	66.092	26.044	.2500	-.00015
538.000	68.087	27.360	.2488	-.00014
546.000	70.074	28.672	.2478	-.00013
554.000	72.052	29.980	.2468	-.00012
562.000	74.022	31.284	.2458	-.00011
570.000	75.985	32.585	.2449	-.00011
578.000	77.941	33.882	.2441	-.00010
586.000	79.891	35.175	.2433	-.00010
594.000	81.834	36.466	.2426	-.00009
602.000	83.772	37.753	.2418	-.00009
610.000	85.704	39.038	.2412	-.00008
618.000	87.631	40.320	.2405	-.00008
626.000	89.552	41.599	.2399	-.00007
634.000	91.469	42.876	.2393	-.00007
642.000	93.382	44.150	.2388	-.00007
650.000	95.290	45.422	.2383	-.00006
658.000	97.194	46.692	.2378	-.00006
666.000	99.095	47.959	.2373	-.00006
674.000	100.991	49.225	.2369	-.00005
682.000	102.884	50.488	.2364	-.00005
690.000	104.774	51.750	.2360	-.00005
698.000	106.660	53.010	.2356	-.00005

Table 18. Continued

ISOBUTANE ISOCHORE AT 3.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
406.982	35.911	.439	.4888	-.01521
410.000	37.360	1.033	.4756	-.00193
418.000	41.124	2.536	.4666	-.00075
426.000	44.836	4.055	.4616	-.00053
434.000	48.513	5.591	.4579	-.00043
442.000	52.163	7.142	.4547	-.00037
450.000	55.790	8.706	.4519	-.00032
458.000	59.395	10.281	.4495	-.00029
466.000	62.982	11.867	.4473	-.00027
474.000	66.552	13.462	.4452	-.00024
482.000	70.106	15.066	.4433	-.00023
490.000	73.646	16.677	.4416	-.00021
498.000	77.172	18.296	.4400	-.00020
506.000	80.685	19.921	.4385	-.00018
514.000	84.187	21.552	.4370	-.00017
522.000	87.678	23.188	.4357	-.00016
530.000	91.159	24.829	.4344	-.00015
538.000	94.629	26.475	.4332	-.00015
546.000	98.090	28.125	.4321	-.00014
554.000	101.543	29.779	.4310	-.00013
562.000	104.987	31.436	.4300	-.00012
570.000	108.423	33.097	.4290	-.00012
578.000	111.852	34.760	.4281	-.00011
586.000	115.273	36.426	.4272	-.00011
594.000	118.688	38.094	.4264	-.00010
602.000	122.096	39.764	.4256	-.00010
610.000	125.497	41.437	.4248	-.00009
618.000	128.893	43.111	.4241	-.00009
626.000	132.283	44.786	.4234	-.00009
634.000	135.667	46.463	.4227	-.00008
642.000	139.047	48.141	.4221	-.00008
650.000	142.421	49.821	.4214	-.00008
658.000	145.790	51.501	.4208	-.00007
666.000	149.154	53.182	.4203	-.00007
674.000	152.514	54.863	.4197	-.00007
682.000	155.870	56.545	.4192	-.00007
690.000	159.221	58.228	.4187	-.00006
698.000	162.568	59.911	.4182	-.00006

Table 18. Continued

ISOBUTANE ISOCHORE AT 3.860 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
408.000	36.549	0.000	.6341	0.00000
410.000	37.817	.365	.6341	-.00000
418.000	42.890	1.982	.6341	-.00000
426.000	47.962	3.691	.6340	-.00001
434.000	53.034	5.458	.6340	-.C0001
442.000	58.105	7.268	.6339	-.00001
450.000	63.176	9.115	.6337	-.00002
458.000	68.245	10.994	.6336	-.00002
466.000	73.313	12.901	.6334	-.00002
474.000	78.380	14.833	.6333	-.00002
482.000	83.445	16.789	.6331	-.00002
490.000	88.509	18.765	.6329	-.00003
498.000	93.571	20.760	.6326	-.00003
506.000	98.631	22.772	.6324	-.C0003
514.000	103.689	24.800	.6322	-.00003
522.000	108.746	26.843	.6319	-.00003
530.000	113.800	28.900	.6316	-.00003
538.000	118.852	30.969	.6314	-.00004
546.000	123.902	33.049	.6311	-.00004
554.000	128.949	35.140	.6308	-.00004
562.000	133.994	37.240	.6305	-.00004
570.000	139.037	39.350	.6302	-.00004
578.000	144.077	41.468	.6299	-.C0004
586.000	149.115	43.593	.6295	-.00004
594.000	154.150	45.726	.6292	-.C0004
602.000	159.182	47.865	.6289	-.00004
610.000	164.212	50.010	.6286	-.00004
618.000	169.239	52.160	.6282	-.00004
626.000	174.263	54.316	.6279	-.00004
634.000	179.285	56.476	.6275	-.00004
642.000	184.304	58.640	.6272	-.00004
650.000	189.320	60.808	.6268	-.C0004
658.000	194.333	62.980	.6265	-.00004
666.000	199.343	65.154	.6261	-.00005
674.000	204.350	67.332	.6257	-.00005
682.000	209.355	69.512	.6254	-.00005
690.000	214.356	71.695	.6250	-.00005
698.000	219.355	73.879	.6246	-.C0005

Table 18. Continued

ISOBUTANE ISOCHORE AT 4.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
407.996	36.546	.002	.6524	.78005
410.000	37.869	.384	.6615	.00069
418.000	43.173	2.075	.6640	.00018
426.000	48.490	3.861	.6651	.00012
434.000	53.815	5.707	.6660	.00009
442.000	59.145	7.598	.6666	.00007
450.000	64.480	9.529	.6671	.00006
458.000	69.818	11.493	.6675	.00004
466.000	75.159	13.486	.6678	.00004
474.000	80.502	15.506	.6680	.00003
482.000	85.847	17.550	.6682	.00002
490.000	91.194	19.615	.6684	.00002
498.000	96.541	21.701	.6685	.00001
506.000	101.889	23.804	.6686	.00001
514.000	107.238	25.924	.6686	.00000
522.000	112.587	28.060	.6686	-.00000
530.000	117.935	30.209	.6685	-.00001
538.000	123.283	32.372	.6685	-.00001
546.000	128.631	34.546	.6684	-.00001
554.000	133.977	36.732	.6683	-.00002
562.000	139.323	38.927	.6681	-.00002
570.000	144.668	41.133	.6680	-.00002
578.000	150.011	43.346	.6678	-.00002
586.000	155.353	45.568	.6676	-.00002
594.000	160.693	47.797	.6674	-.00003
602.000	166.032	50.033	.6672	-.00003
610.000	171.368	52.275	.6670	-.00003
618.000	176.703	54.523	.6667	-.00003
626.000	182.036	56.776	.6665	-.00003
634.000	187.367	59.034	.6662	-.00003
642.000	192.695	61.296	.6659	-.00004
650.000	198.022	63.562	.6656	-.00004
658.000	203.346	65.832	.6653	-.00004
666.000	208.667	68.105	.6650	-.00004
674.000	213.986	70.381	.6647	-.00004
682.000	219.303	72.660	.6644	-.00004
690.000	224.617	74.941	.6641	-.00004
698.000	229.928	77.224	.6637	-.00004

Table 18. Continued

ISOBUTANE ISOCHORE AT   5.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
406.394	35.549	1.193	.9130	.01193
410.000	38.882	2.561	.9311	.00271
418.000	46.394	5.506	.9450	.00124
426.000	53.989	8.468	.9533	.00089
434.000	61.642	11.455	.9596	.00071
442.000	69.340	14.464	.9648	.00060
450.000	77.077	17.493	.9693	.00052
458.000	84.847	20.539	.9732	.00045
466.000	92.646	23.602	.9766	.00040
474.000	100.471	26.679	.9796	.00036
482.000	108.319	29.768	.9824	.00032
490.000	116.188	32.870	.9848	.00029
498.000	124.076	35.982	.9870	.00026
506.000	131.980	39.104	.9890	.00024
514.000	139.899	42.234	.9908	.00021
522.000	147.832	45.373	.9924	.00019
530.000	155.777	48.518	.9938	.00017
538.000	163.732	51.670	.9951	.00015
546.000	171.698	54.828	.9963	.00014
554.000	179.672	57.991	.9973	.00012
562.000	187.654	61.158	.9982	.00011
570.000	195.643	64.330	.9990	.00009
578.000	203.638	67.505	.9997	.00008
586.000	211.638	70.683	1.0003	.00007
594.000	219.643	73.865	1.0008	.00006
602.000	227.652	77.048	1.0013	.00005
610.000	235.664	80.234	1.0017	.00004
618.000	243.678	83.421	1.0020	.00003
626.000	251.695	86.610	1.0022	.00003
634.000	259.713	89.800	1.0024	.00002
642.000	267.732	92.991	1.0025	.00001
650.000	275.752	96.183	1.0025	.00000
658.000	283.772	99.374	1.0025	-.00000
666.000	291.793	102.566	1.0025	-.00001
674.000	299.812	105.758	1.0024	-.00001
682.000	307.831	108.950	1.0023	-.00002
690.000	315.849	112.141	1.0022	-.00002
698.000	323.866	115.332	1.0020	-.00003

Table 18. Continued

ISOBUTANE ISOCHORE AT 6.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
398.797	31.212	10.228	1.4092	.00261
402.000	35.737	12.302	1.4162	.00184
410.000	47.116	17.348	1.4277	.00117
418.000	58.571	22.307	1.4358	.00090
426.000	70.085	27.218	1.4423	.00074
434.000	81.645	32.095	1.4477	.00063
442.000	93.247	36.944	1.4524	.00055
450.000	104.883	41.770	1.4565	.00048
458.000	116.550	46.576	1.4601	.00042
466.000	128.244	51.363	1.4633	.00037
474.000	139.961	56.133	1.4661	.00033
482.000	151.701	60.888	1.4686	.00029
490.000	163.459	65.629	1.4708	.00026
498.000	175.233	70.355	1.4728	.00023
506.000	187.023	75.069	1.4745	.00020
514.000	198.825	79.769	1.4760	.00018
522.000	210.638	84.458	1.4773	.00015
530.000	222.462	89.136	1.4785	.00013
538.000	234.294	93.802	1.4795	.00011
546.000	246.133	98.458	1.4803	.00009
554.000	257.978	103.104	1.4810	.00008
562.000	269.828	107.739	1.4815	.00006
570.000	281.682	112.365	1.4820	.00005
578.000	293.539	116.981	1.4823	.00003
586.000	305.399	121.588	1.4825	.00002
594.000	317.260	126.186	1.4827	.00001
602.000	329.121	130.776	1.4827	-.00000
610.000	340.982	135.357	1.4826	-.00001
618.000	352.843	139.929	1.4825	-.00002
626.000	364.703	144.493	1.4823	-.00003
634.000	376.560	149.050	1.4821	-.00004
642.000	388.415	153.598	1.4817	-.00004
650.000	400.268	158.138	1.4813	-.00005
658.000	412.117	162.671	1.4809	-.00006
666.000	423.962	167.197	1.4804	-.00006
674.000	435.803	171.715	1.4799	-.00007
682.000	447.640	176.226	1.4793	-.00008
690.000	459.472	180.730	1.4787	-.00008
698.000	471.298	185.227	1.4780	-.00009

Table 18. Continued

ISOBUTANE ISOCHORE AT 7.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
382.375	23.454	37.171	2.1589	.00061
386.000	31.284	40.368	2.1610	.00053
394.000	48.588	47.368	2.1647	.00041
402.000	65.917	54.311	2.1676	.00033
410.000	83.268	61.209	2.1700	.00027
418.000	100.637	68.068	2.1719	.00022
426.000	118.019	74.892	2.1735	.00017
434.000	135.412	81.685	2.1748	.00014
442.000	152.814	88.449	2.1757	.00010
450.000	170.223	95.186	2.1764	.00008
458.000	187.636	101.897	2.1769	.00005
466.000	205.053	108.584	2.1772	.00003
474.000	222.472	115.249	2.1774	.00000
482.000	239.891	121.891	2.1773	-.00002
490.000	257.308	128.513	2.1771	-.00003
498.000	274.724	135.114	2.1768	-.00005
506.000	292.136	141.696	2.1763	-.00007
514.000	309.544	148.259	2.1757	-.00008
522.000	326.947	154.805	2.1750	-.00009
530.000	344.344	161.332	2.1742	-.00011
538.000	361.734	167.843	2.1733	-.00012
546.000	379.116	174.337	2.1723	-.00013
554.000	396.490	180.815	2.1712	-.00014
562.000	413.855	187.277	2.1701	-.00015
570.000	431.211	193.724	2.1689	-.00016
578.000	448.557	200.157	2.1676	-.00016
586.000	465.893	206.575	2.1663	-.00017
594.000	483.217	212.978	2.1649	-.00018
602.000	500.530	219.368	2.1634	-.00018
610.000	517.832	225.744	2.1619	-.00019
618.000	535.121	232.107	2.1604	-.00019
626.000	552.398	238.457	2.1588	-.00020
634.000	569.662	244.795	2.1572	-.00020
642.000	586.913	251.119	2.1556	-.00021
650.000	604.151	257.432	2.1539	-.00021
658.000	621.375	263.732	2.1522	-.00022
666.000	638.586	270.020	2.1504	-.00022
674.000	655.782	276.297	2.1487	-.00022
682.000	672.964	282.562	2.1469	-.00022
690.000	690.132	288.816	2.1451	-.00023
698.000	707.285	295.059	2.1432	-.00023

Table 18. Continued

ISOBUTANE ISOCHORE AT 8.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
355.886	14.246	91.446	3.1724	.00009
358.000	20.952	93.945	3.1725	.00007
362.000	33.643	98.669	3.1728	.00005
366.000	46.334	103.387	3.1729	.00003
370.000	59.026	108.099	3.1730	.00001
374.000	71.718	112.805	3.1730	-.00001
378.000	84.410	117.506	3.1729	-.00003
382.000	97.101	122.201	3.1727	-.00005
386.000	109.792	126.890	3.1725	-.00007
390.000	122.481	131.574	3.1722	-.00008
394.000	135.169	136.253	3.1718	-.00010
398.000	147.855	140.927	3.1714	-.00012
402.000	160.540	145.595	3.1709	-.00013
406.000	173.222	150.258	3.1703	-.00014
410.000	185.902	154.917	3.1697	-.00016
414.000	198.580	159.570	3.1691	-.00017
418.000	211.255	164.218	3.1684	-.00018
422.000	223.927	168.861	3.1676	-.00019
426.000	236.596	173.499	3.1668	-.00020
430.000	249.262	178.132	3.1660	-.00021
434.000	261.924	182.760	3.1651	-.00022
438.000	274.583	187.383	3.1642	-.00023
442.000	287.238	192.002	3.1633	-.00024
446.000	299.889	196.615	3.1623	-.00025
450.000	312.536	201.224	3.1613	-.00026
454.000	325.179	205.828	3.1602	-.00027
458.000	337.818	210.427	3.1591	-.00028
462.000	350.452	215.021	3.1580	-.00028
466.000	363.082	219.611	3.1569	-.00029
470.000	375.707	224.196	3.1557	-.00030
474.000	388.327	228.776	3.1545	-.00030
478.000	400.943	233.352	3.1533	-.00031
482.000	413.554	237.923	3.1520	-.00032
486.000	426.159	242.489	3.1508	-.00032
490.000	438.760	247.051	3.1495	-.00033
494.000	451.355	251.608	3.1481	-.00033
498.000	463.945	256.160	3.1468	-.00034
502.000	476.529	260.708	3.1455	-.00034
506.000	489.108	265.252	3.1441	-.00035
510.000	501.682	269.791	3.1427	-.00035
514.000	514.250	274.325	3.1413	-.00035
518.000	526.812	278.855	3.1398	-.00036
522.000	539.368	283.381	3.1384	-.00036
526.000	551.919	287.902	3.1369	-.00037
530.000	564.464	292.418	3.1355	-.00037
534.000	577.003	296.931	3.1340	-.00037
538.000	589.536	301.438	3.1325	-.00038
542.000	602.063	305.942	3.1310	-.00038
546.000	614.583	310.441	3.1294	-.00038
550.000	627.098	314.936	3.1279	-.00039
554.000	639.607	319.426	3.1264	-.00039
558.000	652.109	323.912	3.1248	-.00039
562.000	664.605	328.394	3.1232	-.00039
566.000	677.095	332.872	3.1216	-.00040
570.000	689.578	337.345	3.1201	-.00040
574.000	702.055	341.814	3.1185	-.00040
578.000	714.526	346.279	3.1169	-.00040

Table 18. Continued

ISOBUTANE ISOCHORE AT 9.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
319.060	6.243	185.667	4.5906	.00001
322.000	19.740	190.670	4.5905	-.00002
326.000	38.101	197.472	4.5904	-.C0006
330.000	56.462	204.267	4.5901	-.00009
334.000	74.822	211.056	4.5896	-.00012
338.000	93.179	217.837	4.5891	-.C0016
342.000	111.534	224.611	4.5884	-.00018
346.000	129.886	231.379	4.5876	-.00021
350.000	148.235	238.139	4.5867	-.00024
354.000	166.580	244.892	4.5857	-.00026
358.000	184.921	251.639	4.5846	-.00029
362.000	203.257	258.377	4.5834	-.00031
366.000	221.588	265.109	4.5821	-.00033
370.000	239.913	271.834	4.5807	-.00035
374.000	258.234	278.551	4.5793	-.00037
378.000	276.548	285.261	4.5777	-.C0039
382.000	294.855	291.963	4.5761	-.00041
386.000	313.157	298.658	4.5745	-.C0043
390.000	331.451	305.346	4.5727	-.00044
394.000	349.738	312.027	4.5709	-.00046
398.000	363.018	318.700	4.5690	-.00048
402.000	386.290	325.366	4.5671	-.00049
406.000	404.555	332.024	4.5651	-.00050
410.000	422.811	338.675	4.5631	-.00052
414.000	441.059	345.318	4.5610	-.C0053
418.000	459.299	351.954	4.5589	-.00054
422.000	477.530	358.583	4.5567	-.00055
426.000	495.752	365.204	4.5544	-.00056
430.000	513.966	371.818	4.5522	-.00057
434.000	532.170	378.424	4.5499	-.00058
438.000	550.364	385.023	4.5475	-.00059
442.000	568.550	391.614	4.5451	-.C0060
446.000	586.725	398.198	4.5427	-.00061
450.000	604.891	404.775	4.5403	-.00062
454.000	623.048	411.345	4.5378	-.00062
458.000	641.194	417.907	4.5353	-.00063
462.000	659.330	424.461	4.5327	-.00064
466.000	677.456	431.008	4.5302	-.00064
470.000	695.571	437.548	4.5276	-.00065
474.000	713.676	444.081	4.5250	-.00066

Table 18. Continued

ISOBUTANE ISOCHORE AT 10.000 MOL/L

T,K	P,BAR	DP/DD	DP/CT	D2P/DT2
272.535	1.544	337.524	6.6935	.00000
274.000	11.351	341.303	6.6935	-.00003
276.000	24.738	346.457	6.6934	-.00007
278.000	38.124	351.606	6.6932	-.00010
280.000	51.511	356.752	6.6930	-.00014
282.000	64.896	361.894	6.6926	-.00017
284.000	78.281	367.032	6.6923	-.C0021
286.000	91.665	372.165	6.6918	-.00024
288.000	105.048	377.295	6.6913	-.00027
290.000	118.430	382.421	6.6907	-.00030
292.000	131.811	387.542	6.6901	-.00033
294.000	145.191	392.660	6.6894	-.00036
296.000	158.569	397.773	6.6886	-.C0039
298.000	171.945	402.882	6.6878	-.00042
300.000	185.320	407.988	6.6869	-.00045
302.000	198.693	413.089	6.6860	-.00047
304.000	212.064	418.186	6.6851	-.00050
306.000	225.433	423.279	6.6840	-.00052
308.000	238.800	428.368	6.6830	-.00055
310.000	252.165	433.453	6.6818	-.C0057
312.000	265.527	438.533	6.6807	-.C0059
314.000	278.887	443.610	6.6795	-.00062
316.000	292.245	448.683	6.6782	-.00064
318.000	305.600	453.752	6.6769	-.00066
320.000	318.953	458.816	6.6756	-.C0068
322.000	332.302	463.877	6.6742	-.00070
324.000	345.649	468.933	6.6728	-.00072
326.000	358.994	473.985	6.6713	-.00074
328.000	372.335	479.034	6.6698	-.C0075
330.000	385.673	484.078	6.6683	-.00077
332.000	399.008	489.118	6.6668	-.00079
334.000	412.340	494.155	6.6652	-.00081
336.000	425.669	499.187	6.6635	-.00082
338.000	438.994	504.215	6.6619	-.C0084
340.000	452.316	509.239	6.6602	-.00085
342.000	465.635	514.259	6.6585	-.00087
344.000	478.950	519.275	6.6567	-.00088
346.000	492.262	524.287	6.6549	-.00090
348.000	505.570	529.296	6.6531	-.00091
350.000	518.874	534.300	6.6513	-.00092
352.000	532.175	539.300	6.6494	-.00094
354.000	545.472	544.296	6.6475	-.00095
356.000	558.765	549.288	6.6456	-.00096
358.000	572.054	554.276	6.6437	-.00097
360.000	585.333	559.261	6.6417	-.00099
362.000	598.621	564.241	6.6397	-.00100
364.000	611.898	569.217	6.6377	-.C0101
366.000	625.172	574.190	6.6357	-.00102
368.000	638.441	579.158	6.6337	-.00103
370.000	651.707	584.123	6.6316	-.00104
372.000	664.968	589.083	6.6295	-.00105
374.000	678.225	594.040	6.6274	-.00106
376.000	691.477	598.993	6.6253	-.00107
378.000	704.726	603.942	6.6231	-.00108
380.000	717.970	608.887	6.6210	-.00109

Table 18. Continued

ISOBUTANE ISOCHORE AT 11.000 MOL/L

T,K	P,BAR	DP/DD	DP/CT	D2P/DT2
218.260	.124	569.041	9.9623	.00000
220.000	17.456	576.185	9.9622	-.00008
222.000	37.380	584.388	9.9620	-.00017
224.000	57.304	592.580	9.9615	-.00026
226.000	77.226	600.761	9.9609	-.00034
228.000	97.147	608.931	9.9602	-.00042
230.000	117.067	617.091	9.9592	-.00050
232.000	136.984	625.240	9.9582	-.00058
234.000	156.899	633.378	9.9569	-.00065
236.000	176.812	641.506	9.9556	-.00072
238.000	196.721	649.624	9.9540	-.00079
240.000	216.628	657.730	9.9524	-.00085
242.000	236.531	665.827	9.9506	-.00092
244.000	256.430	673.912	9.9487	-.00098
246.000	276.326	681.988	9.9467	-.00104
248.000	296.217	690.053	9.9446	-.00109
250.000	316.104	698.108	9.9424	-.00115
252.000	335.987	706.152	9.9400	-.00120
254.000	355.864	714.186	9.9376	-.00125
256.000	375.737	722.210	9.9350	-.00130
258.000	395.604	730.224	9.9324	-.00135
260.000	415.466	738.227	9.9296	-.00139
262.000	435.322	746.221	9.9268	-.00144
264.000	455.173	754.204	9.9239	-.00148
266.000	475.018	762.178	9.9208	-.00152
268.000	494.856	770.141	9.9178	-.00156
270.000	514.689	778.095	9.9146	-.00160
272.000	534.515	786.038	9.9113	-.00164
274.000	554.334	793.972	9.9080	-.00168
276.000	574.147	801.896	9.9046	-.00171
278.000	593.953	809.810	9.9012	-.00174
280.000	613.751	817.714	9.8977	-.00178
282.000	633.543	825.609	9.8941	-.00181
284.000	653.328	833.494	9.8904	-.00184
286.000	673.105	841.370	9.8867	-.00187
288.000	692.875	849.235	9.8830	-.00190
290.000	712.637	857.092	9.8792	-.00192

Table 18. Continued

ISOBUTANE ISOCHORE AT 12.000 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
159.321	.001	925.928	15.3789	.00000
160.000	10.449	930.745	15.3789	-.00010
161.000	25.827	937.829	15.3787	-.00023
162.000	41.206	944.904	15.3784	-.00037
163.000	56.584	951.970	15.3780	-.00050
164.000	71.962	959.028	15.3774	-.00063
165.000	87.339	966.078	15.3767	-.00075
166.000	102.715	973.119	15.3759	-.00087
167.000	118.091	980.153	15.3750	-.00099
168.000	133.465	987.178	15.3739	-.00111
169.000	148.839	994.194	15.3728	-.00122
170.000	164.211	1001.203	15.3715	-.00133
171.000	179.582	1008.203	15.3701	-.00144
172.000	194.951	1015.195	15.3686	-.00154
173.000	210.319	1022.180	15.3670	-.00164
174.000	225.685	1029.156	15.3653	-.00174
175.000	241.049	1036.124	15.3636	-.00184
176.000	256.412	1043.084	15.3617	-.00194
177.000	271.773	1050.037	15.3597	-.00203
178.000	287.131	1056.981	15.3576	-.00212
179.000	302.488	1063.918	15.3554	-.00221
180.000	317.842	1070.847	15.3532	-.00229
181.000	333.194	1077.768	15.3509	-.00238
182.000	348.544	1084.681	15.3484	-.00246
183.000	363.891	1091.586	15.3459	-.00254
184.000	379.236	1098.484	15.3434	-.00262
185.000	394.578	1105.375	15.3407	-.00270
186.000	409.917	1112.257	15.3380	-.00277
187.000	425.254	1119.132	15.3352	-.00284
188.000	440.587	1126.000	15.3323	-.00291
189.000	455.918	1132.859	15.3293	-.00298
190.000	471.246	1139.712	15.3263	-.00305
191.000	486.571	1146.557	15.3232	-.00312
192.000	501.893	1153.394	15.3201	-.00318
193.000	517.211	1160.224	15.3169	-.00325
194.000	532.526	1167.047	15.3136	-.00331
195.000	547.838	1173.863	15.3103	-.00337
196.000	563.147	1180.671	15.3069	-.00343
197.000	578.452	1187.472	15.3034	-.00348
198.000	593.754	1194.265	15.2999	-.00354
199.000	609.052	1201.052	15.2963	-.00359
200.000	624.346	1207.831	15.2927	-.00365
201.000	639.637	1214.603	15.2890	-.00370
202.000	654.924	1221.368	15.2853	-.00375
203.000	670.208	1228.126	15.2815	-.00380
204.000	685.487	1234.877	15.2777	-.00385
205.000	700.763	1241.620	15.2738	-.00390
206.000	716.035	1248.357	15.2699	-.00394

Table 18. Continued

ISOBUTANE ISOCHORE AT 12.755 MOL/L

T,K	P,BAR	DP/DD	DP/DT	D2P/DT2
113.550	.000	1358.639	22.3188	.00000
114.000	10.043	1363.997	22.3188	-.00018
115.000	32.362	1375.886	22.3184	-.00058
116.000	54.680	1387.750	22.3176	-.00097
117.000	76.997	1399.590	22.3165	-.00134
118.000	99.313	1411.406	22.3149	-.00170
119.000	121.627	1423.197	22.3131	-.00205
120.000	143.939	1434.964	22.3109	-.00238
121.000	166.249	1446.707	22.3083	-.00270
122.000	188.556	1458.427	22.3055	-.00302
123.000	210.859	1470.124	22.3023	-.00332
124.000	233.160	1481.797	22.2988	-.00361
125.000	255.457	1493.447	22.2951	-.00389
126.000	277.750	1505.075	22.2910	-.00417
127.000	300.039	1516.679	22.2867	-.00443
128.000	322.323	1528.262	22.2822	-.00468
129.000	344.603	1539.822	22.2774	-.00493
130.000	366.878	1551.359	22.2723	-.00517
131.000	389.148	1562.875	22.2670	-.00540
132.000	411.412	1574.369	22.2615	-.00562
133.000	433.671	1585.841	22.2558	-.00584
134.000	455.924	1597.292	22.2499	-.00605
135.000	478.170	1608.722	22.2437	-.00625
136.000	500.411	1620.130	22.2374	-.00644
137.000	522.645	1631.518	22.2308	-.00663
138.000	544.873	1642.884	22.2241	-.00681
139.000	567.093	1654.230	22.2172	-.00699
140.000	589.307	1665.555	22.2101	-.00716
141.000	611.514	1676.860	22.2029	-.00732
142.000	633.713	1688.145	22.1955	-.00748
143.000	655.904	1699.409	22.1879	-.00764
144.000	678.089	1710.654	22.1802	-.00779
145.000	700.265	1721.879	22.1724	-.00793

TABLE 19. Calculated P(ρ) isotherms

The following pages give P(ρ) isotherms, as computed by the equation of state (6). The third column DP/DD is the isotherm slope $(\partial P/\partial \rho)$ in units of the bar and mol/L. The last two columns give the isochore slopes and curvatures, DP/DT $\equiv (\partial P/\partial T)$, D2P/DT2 $\equiv (\partial^2 P/\partial T^2)$ in units of the bar and kelvins.

These tables show that $\partial P/\partial \rho$ is non-negative, and that it increases monotonically with density.

Table 19. Calculated P(ρ) isotherms

ISOBUTANE ISOTHERM AT 120.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.000	.000	9.977	.0000	-.000000
12.649	-.000	1284.023	21.1068	.000000
12.650	1.270	1285.354	21.1176	-.000021
12.660	14.191	1298.888	21.2278	-.000234
12.670	27.249	1312.567	21.3388	-.000450
12.680	40.443	1326.391	21.4504	-.000668
12.690	53.777	1340.365	21.5627	-.000888
12.700	67.251	1354.489	21.6758	-.001111
12.710	80.867	1368.765	21.7896	-.001336
12.720	94.627	1383.197	21.9041	-.001564
12.730	108.532	1397.787	22.0194	-.001794
12.740	122.583	1412.536	22.1354	-.002026
12.750	136.783	1427.447	22.2522	-.002262
12.760	151.133	1442.523	22.3697	-.002499
12.770	165.634	1457.766	22.4881	-.002740

Table 19. Continued

ISOBUTANE ISOTHERM AT 140.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.000	.000	11.639	.0000	-.000000
12.320	.000	1084.373	17.8901	.000000
12.320	.296	1084.665	17.8925	-.000004
12.330	11.197	1095.427	17.9797	-.000135
12.340	22.205	1106.289	18.0674	-.000267
12.350	33.323	1117.254	18.1556	-.000401
12.360	44.551	1128.323	18.2443	-.000536
12.370	55.890	1139.497	18.3336	-.000673
12.380	67.341	1150.777	18.4234	-.000811
12.390	78.906	1162.165	18.5137	-.000950
12.400	90.585	1173.662	18.6045	-.001091
12.410	102.379	1185.269	18.6959	-.001234
12.420	114.290	1196.988	18.7878	-.001378
12.430	126.319	1208.820	18.8802	-.001523
12.440	138.467	1220.767	18.9732	-.001670
12.450	150.735	1232.831	19.0668	-.001818
12.460	163.124	1245.011	19.1609	-.001968
12.470	175.636	1257.312	19.2555	-.002120
12.480	188.271	1269.732	19.3507	-.002273
12.490	201.031	1282.276	19.4465	-.002427
12.500	213.917	1294.943	19.5429	-.002583
12.510	226.930	1307.735	19.6398	-.002741
12.520	240.072	1320.655	19.7374	-.002901
12.530	253.344	1333.704	19.8355	-.003062
12.540	266.746	1346.884	19.9342	-.003225
12.550	280.280	1360.195	20.0335	-.003389
12.560	293.950	1373.642	20.1334	-.003555
12.570	307.754	1387.225	20.2339	-.003723
12.580	321.695	1400.945	20.3351	-.003892
12.590	335.774	1414.806	20.4368	-.004064
12.600	349.992	1428.808	20.5392	-.004237
12.610	364.351	1442.954	20.6422	-.004412
12.620	378.852	1457.246	20.7459	-.004588
12.630	393.496	1471.685	20.8501	-.004767
12.640	408.286	1486.275	20.9551	-.004947
12.650	423.222	1501.017	21.0607	-.005129
12.660	438.307	1515.912	21.1669	-.005313
12.670	453.541	1530.965	21.2738	-.005499
12.680	468.927	1546.176	21.3814	-.005687
12.690	484.465	1561.547	21.4896	-.005877
12.700	500.158	1577.083	21.5986	-.006068
12.710	516.008	1592.784	21.7082	-.006262
12.720	532.015	1608.653	21.8185	-.006458
12.730	548.181	1624.692	21.9295	-.006656
12.740	564.509	1640.905	22.0412	-.006855
12.750	581.000	1657.294	22.1536	-.007057
12.760	597.656	1673.861	22.2668	-.007261
12.770	614.478	1690.610	22.3807	-.007467
12.780	631.468	1707.542	22.4953	-.007675
12.790	648.629	1724.661	22.6106	-.007886
12.800	665.962	1741.969	22.7267	-.008098
12.810	683.469	1759.470	22.8436	-.008313
12.820	701.152	1777.167	22.9612	-.008530
12.830	719.013	1795.062	23.0796	-.008749

Table 19. Continued

ISOBUTANE ISOTHERM AT 160.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.000	.001	13.293	.0000	-.000000
11.989	.001	920.843	15.2991	.000000
12.000	10.449	930.745	15.3789	-.000095
12.020	29.241	948.530	15.5214	-.000267
12.040	48.392	966.619	15.6654	-.000442
12.060	67.908	985.021	15.8111	-.000621
12.080	87.795	1003.742	15.9582	-.000803
12.100	108.060	1022.789	16.1070	-.000989
12.120	128.709	1042.169	16.2575	-.001179
12.140	149.749	1061.890	16.4095	-.001372
12.160	171.187	1081.959	16.5633	-.001570
12.180	193.029	1102.385	16.7187	-.001771
12.200	215.284	1123.175	16.8759	-.001976
12.220	237.959	1144.338	17.0348	-.002185
12.240	261.060	1165.883	17.1955	-.002399
12.260	284.597	1187.819	17.3580	-.002616
12.280	308.576	1210.155	17.5223	-.002838
12.300	333.006	1232.900	17.6884	-.003064
12.320	357.895	1256.066	17.8564	-.003295
12.340	383.251	1279.661	18.0264	-.003530
12.360	409.084	1303.696	18.1983	-.003770
12.380	435.402	1328.183	18.3721	-.004014
12.400	462.214	1353.132	18.5480	-.004263
12.420	489.531	1378.556	18.7258	-.004518
12.440	517.360	1404.466	18.9058	-.004777
12.460	545.713	1430.876	19.0878	-.005041
12.480	574.598	1457.797	19.2719	-.005310
12.500	604.028	1485.244	19.4583	-.005585
12.520	634.012	1513.230	19.6468	-.005865
12.540	664.561	1541.769	19.8375	-.006150
12.560	695.685	1570.877	20.0306	-.006441

Table 19. Continued

ISOBUTANE ISOTHERM AT 180.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.000	.007	14.918	.0000	-.000000
11.655	.007	783.101	13.1630	.000000
11.660	4.213	786.986	13.1941	-.000030
11.680	20.099	801.636	13.3110	-.000144
11.700	36.280	816.517	13.4291	-.000260
11.720	52.761	831.634	13.5484	-.000378
11.740	69.547	846.992	13.6689	-.000498
11.760	86.642	862.595	13.7906	-.000621
11.780	104.052	878.448	13.9136	-.000746
11.800	121.782	894.556	14.0378	-.000874
11.820	139.836	910.924	14.1634	-.001004
11.840	158.221	927.557	14.2902	-.001137
11.860	176.940	944.461	14.4183	-.001272
11.880	196.001	961.641	14.5477	-.001410
11.900	215.408	979.103	14.6785	-.001550
11.920	235.167	996.852	14.8106	-.001693
11.940	255.284	1014.895	14.9442	-.001839
11.960	275.765	1033.238	15.0791	-.001988
11.980	296.615	1051.886	15.2154	-.002139
12.000	317.842	1070.847	15.3532	-.002293
12.020	339.451	1090.126	15.4924	-.002450
12.040	361.449	1109.732	15.6331	-.002611
12.060	383.843	1129.671	15.7753	-.002774
12.080	406.639	1149.949	15.9190	-.002940
12.100	429.843	1170.576	16.0643	-.003109
12.120	453.464	1191.558	16.2111	-.003282
12.140	477.508	1212.903	16.3595	-.003458
12.160	501.983	1234.620	16.5095	-.003637
12.180	526.895	1256.717	16.6611	-.003819
12.200	552.254	1279.202	16.8143	-.004005
12.220	578.066	1302.085	16.9693	-.004194
12.240	604.340	1325.375	17.1259	-.004387
12.260	631.084	1349.082	17.2842	-.004583
12.280	658.306	1373.215	17.4443	-.004783
12.300	686.015	1397.784	17.6062	-.004987
12.320	714.220	1422.801	17.7698	-.005195

Table 19. Continued

ISOBUTANE ISOTHERM AT 200.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.002	.037	16.480	.0002	-.000000
11.316	.037	664.476	11.3689	.000000
11.320	2.897	667.082	11.3896	-.000016
11.340	16.360	679.326	11.4868	-.000094
11.360	30.071	691.751	11.5850	-.000172
11.380	44.032	704.360	11.6841	-.000253
11.400	58.247	717.158	11.7841	-.000335
11.420	72.719	730.146	11.8852	-.000418
11.440	87.454	743.328	11.9872	-.000503
11.460	102.454	756.708	12.0901	-.000590
11.480	117.723	770.290	12.1941	-.000678
11.500	133.267	784.076	12.2992	-.000768
11.520	149.088	798.070	12.4052	-.000860
11.540	165.191	812.277	12.5123	-.000953
11.560	181.580	826.700	12.6204	-.001048
11.580	198.260	841.343	12.7296	-.001145
11.600	215.236	856.210	12.8398	-.001244
11.620	232.510	871.305	12.9512	-.001345
11.640	250.089	886.632	13.0637	-.001447
11.660	267.977	902.197	13.1772	-.001552
11.680	286.179	918.002	13.2919	-.001658
11.700	304.699	934.054	13.4078	-.001766
11.720	323.543	950.356	13.5248	-.001877
11.740	342.715	966.913	13.6429	-.001989
11.760	362.221	983.731	13.7623	-.002103
11.780	382.066	1000.813	13.8829	-.002220
11.800	402.255	1018.167	14.0046	-.002338
11.820	422.794	1035.796	14.1276	-.002459
11.840	443.689	1053.707	14.2519	-.002582
11.860	464.945	1071.904	14.3774	-.002707
11.880	486.567	1090.395	14.5042	-.002834
11.900	508.562	1109.184	14.6323	-.002964
11.920	530.936	1128.278	14.7617	-.003096
11.940	553.696	1147.683	14.8924	-.003231
11.960	576.846	1167.406	15.0245	-.003367
11.980	600.394	1187.453	15.1579	-.003507
12.000	624.346	1207.831	15.2927	-.003648
12.020	648.709	1228.547	15.4289	-.003793
12.040	673.490	1249.609	15.5666	-.003940
12.060	698.696	1271.023	15.7056	-.004089

Table 19.   Continued

ISOBUTANE ISOTHERM AT 220.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.008	.137	17.940	.0006	-.000000
10.970	.137	560.491	9.8380	.000000
10.980	6.036	565.847	9.8805	-.000028
11.000	17.456	576.185	9.9622	-.000081
11.020	29.084	586.668	10.0447	-.000136
11.040	40.924	597.299	10.1279	-.000192
11.060	52.977	608.081	10.2119	-.000249
11.080	65.248	619.015	10.2967	-.000306
11.100	77.739	630.105	10.3822	-.000365
11.120	90.453	641.352	10.4686	-.000426
11.140	103.394	652.760	10.5557	-.000487
11.160	116.565	664.330	10.6437	-.000549
11.180	129.969	676.065	10.7325	-.000613
11.200	143.609	687.969	10.8221	-.000678
11.220	157.489	700.043	10.9126	-.000744
11.240	171.612	712.291	11.0039	-.000811
11.260	185.981	724.715	11.0961	-.000879
11.280	200.601	737.319	11.1891	-.000949
11.300	215.475	750.105	11.2830	-.001020
11.320	230.607	763.077	11.3778	-.001093
11.340	246.000	776.237	11.4735	-.001166
11.360	261.658	789.588	11.5701	-.001241
11.380	277.585	803.135	11.6677	-.001318
11.400	293.784	816.881	11.7661	-.001395
11.420	310.261	830.828	11.8655	-.001474
11.440	327.019	844.980	11.9659	-.001555
11.460	344.062	859.342	12.0672	-.001637
11.480	361.394	873.915	12.1695	-.001720
11.500	379.020	888.706	12.2727	-.001805
11.520	396.944	903.716	12.3770	-.001892
11.540	415.170	918.951	12.4822	-.001980
11.560	433.703	934.414	12.5885	-.002069
11.580	452.548	950.109	12.6958	-.002161
11.600	471.709	966.041	12.8042	-.002253
11.620	491.191	982.214	12.9136	-.002348
11.640	510.999	998.632	13.0240	-.002444
11.660	531.138	1015.300	13.1356	-.002542
11.680	551.613	1032.222	13.2482	-.002641
11.700	572.429	1049.405	13.3620	-.002742
11.720	593.591	1066.851	13.4769	-.002845
11.740	615.105	1084.567	13.5929	-.002950
11.760	636.976	1102.557	13.7100	-.003056
11.780	659.209	1120.828	13.8283	-.003165
11.800	681.811	1139.384	13.9478	-.003275
11.820	704.786	1158.231	14.0685	-.003387

Table 19. Continued

ISOBUTANE ISOTHERM AT 250.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.031	.632	19.728	.0027	-.000001
10.430	.632	425.563	7.9149	.000000
10.440	5.052	429.631	7.9473	-.000016
10.480	22.556	445.642	8.0741	-.000078
10.520	40.709	462.086	8.2031	-.000144
10.560	59.528	478.976	8.3344	-.000211
10.600	79.033	496.325	8.4680	-.000282
10.640	99.241	514.146	8.6039	-.000355
10.680	120.171	532.451	8.7423	-.000431
10.720	141.843	551.254	8.8832	-.000509
10.760	164.278	570.570	9.0265	-.000591
10.800	187.496	590.414	9.1724	-.000676
10.840	211.519	610.800	9.3210	-.000764
10.880	236.368	631.746	9.4722	-.000855
10.920	262.065	653.267	9.6261	-.000949
10.960	288.636	675.382	9.7828	-.001047
11.000	316.104	698.108	9.9424	-.001148
11.040	344.494	721.464	10.1048	-.001253
11.080	373.830	745.469	10.2702	-.001361
11.120	404.140	770.145	10.4387	-.001473
11.160	435.451	795.512	10.6102	-.001590
11.200	467.791	821.593	10.7849	-.001710
11.240	501.188	848.410	10.9628	-.001834
11.280	535.674	875.989	11.1440	-.001963
11.320	571.278	904.354	11.3286	-.002096
11.360	608.033	933.532	11.5166	-.002233
11.400	645.972	963.550	11.7081	-.002375
11.440	685.128	994.438	11.9033	-.002522

Table 19. Continued

ISOBUTANE ISOTHERM AT 300.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.040	.975	23.876	.0034	-.000001
.080	1.908	22.718	.0070	-.000003
.120	2.792	21.491	.0109	-.000006
.160	3.627	20.242	.0149	-.000013
.165	3.736	20.072	.0155	-.000014
9.434	3.736	243.289	5.3965	.000001
9.440	5.313	244.841	5.4096	-.000003
9.480	15.301	254.607	5.4916	-.000027
9.520	25.685	264.636	5.5748	-.000053
9.560	36.475	274.935	5.6595	-.000079
9.600	47.683	285.509	5.7455	-.000106
9.640	59.320	296.367	5.8329	-.000135
9.680	71.397	307.514	5.9217	-.000165
9.720	83.925	318.958	6.0120	-.000196
9.760	96.917	330.705	6.1038	-.000228
9.800	110.386	342.763	6.1970	-.000261
9.840	124.343	355.140	6.2918	-.000295
9.880	138.801	367.842	6.3882	-.000331
9.920	153.774	380.879	6.4861	-.000368
9.960	169.276	394.258	6.5857	-.000407
10.000	185.320	407.988	6.6869	-.000447
10.040	201.920	422.076	6.7899	-.000488
10.080	219.091	436.534	6.8945	-.000531
10.120	236.848	451.368	7.0009	-.000576
10.160	255.205	466.589	7.1090	-.000622
10.200	274.180	482.207	7.2190	-.000670
10.240	293.787	498.232	7.3308	-.000719
10.280	314.044	514.674	7.4445	-.000770
10.320	334.967	531.543	7.5601	-.000823
10.360	356.573	548.852	7.6777	-.000878
10.400	378.881	566.611	7.7973	-.000934
10.440	401.908	584.832	7.9189	-.000993
10.480	425.674	603.528	8.0426	-.001053
10.520	450.197	622.711	8.1684	-.001116
10.560	475.497	642.394	8.2964	-.001180
10.600	501.595	662.592	8.4266	-.001247
10.640	528.512	683.317	8.5590	-.001316
10.680	556.268	704.586	8.6937	-.001387
10.720	584.886	726.413	8.8307	-.001461
10.760	614.389	748.813	8.9701	-.001537
10.800	644.799	771.804	9.1120	-.001615
10.840	676.141	795.402	9.2563	-.001696
10.880	708.440	819.625	9.4031	-.001779

Table 19. Continued

ISOBUTANE ISOTHERM AT 350.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.080	2.257	27.298	.0069	-.0 C0002
.160	4.360	25.261	.0145	-.000006
.240	6.299	23.219	.0226	-.000015
.320	8.076	21.214	.0313	-.000028
.400	9.694	19.254	.0406	-.000047
.480	11.158	17.342	.0505	-.000075
.560	12.470	15.477	.0612	-.000116
.571	12.636	15.229	.0627	-.000124
8.180	12.636	105.031	3.3919	.000056
8.240	19.106	112.395	3.4675	.000035
8.320	28.510	122.782	3.5715	.000009
8.400	38.767	133.757	3.6784	-.000018
8.480	49.927	145.352	3.7883	-.000044
8.560	62.041	157.599	3.9015	-.000071
8.640	75.161	170.530	4.0179	-.000098
8.720	89.345	184.180	4.1378	-.000126
8.800	104.650	198.584	4.2613	-.000156
8.880	121.139	213.779	4.3885	-.000188
8.960	138.877	229.804	4.5197	-.000221
9.040	157.931	246.697	4.6548	-.000257
9.120	178.373	264.501	4.7941	-.000295
9.200	200.277	283.259	4.9378	-.000335
9.280	223.721	303.015	5.0859	-.000378
9.360	248.787	323.816	5.2388	-.000424
9.440	275.561	345.712	5.3964	-.000474
9.520	304.131	368.754	5.5591	-.000526
9.600	334.593	392.996	5.7270	-.000582
9.680	367.044	418.494	5.9002	-.000642
9.760	401.587	445.309	6.0791	-.000706
9.840	438.331	473.504	6.2637	-.000774
9.920	477.387	503.144	6.4544	-.000847
10.000	518.874	534.300	6.6513	-.000924
10.080	562.917	567.046	6.8546	-.001007
10.160	609.646	601.462	7.0647	-.001094
10.240	659.198	637.631	7.2817	-.001137
10.320	711.716	675.642	7.5060	-.001286

Table 19.   Continued

ISOBUTANE ISOTHERM AT 400.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	5.076	30.059	.0142	-.000004
.320	9.611	26.645	.0302	-.000017
.480	13.613	23.411	.0479	-.000038
.640	17.114	20.388	.0674	-.000069
.800	20.149	17.591	.0884	-.000111
.960	22.755	15.023	.1111	-.000163
1.120	24.968	12.681	.1353	-.000231
1.280	26.825	10.560	.1610	-.000317
1.440	28.359	8.652	.1881	-.000430
1.600	29.604	6.945	.2166	-.000598
1.760	30.592	5.427	.2464	-.000829
1.920	31.350	4.084	.2778	-.001265
2.065	31.862	3.004	.3080	-.002206
5.893	31.862	8.577	1.3435	.003022
5.920	32.103	9.165	1.3608	.002779
6.080	33.870	13.047	1.4646	.001860
6.240	36.319	17.707	1.5736	.001356
6.400	39.581	23.214	1.6880	.001023
6.560	43.797	29.635	1.8079	.000780
6.720	49.117	37.037	1.9335	.000593
6.880	55.705	45.495	2.0647	.000442
7.040	63.736	55.091	2.2018	.000318
7.200	73.400	65.923	2.3451	.000214
7.360	84.903	78.106	2.4949	.000127
7.520	98.473	91.771	2.6518	.000053
7.680	114.357	107.069	2.8163	-.000012
7.840	132.831	124.170	2.9892	-.000069
8.000	154.198	143.262	3.1711	-.000123
8.160	178.792	164.550	3.3629	-.000174
8.320	206.983	188.260	3.5655	-.000225
8.480	239.177	214.633	3.7797	-.000278
8.640	275.821	243.929	4.0065	-.000334
8.800	317.405	276.431	4.2469	-.000396
8.960	364.467	312.444	4.5019	-.000464
9.120	417.592	352.297	4.7726	-.000540
9.280	477.426	396.351	5.0602	-.000626
9.440	544.670	445.000	5.3659	-.000722
9.600	620.094	498.677	5.6910	-.000830
9.760	704.540	557.858	6.0370	-.000951

92

Table 19. Continued

ISOBUTANE ISOTHERM AT 408.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	5.190	30.812	.0142	-.000004
.320	9.852	27.485	.0301	-.000016
.480	13.995	24.335	.0476	-.000036
.640	17.650	21.395	.0668	-.000064
.800	20.853	18.677	.0876	-.000100
.960	23.639	16.185	.1099	-.000146
1.120	26.044	13.915	.1336	-.000202
1.280	28.103	11.863	.1587	-.000268
1.440	29.851	10.019	.1850	-.000347
1.600	31.320	8.372	.2126	-.000442
1.760	32.540	6.911	.2411	-.000556
1.920	33.541	5.623	.2706	-.000694
2.080	34.348	4.498	.3008	-.000867
2.240	34.988	3.523	.3316	-.001088
2.400	35.483	2.688	.3628	-.001380
2.560	35.855	1.984	.3944	-.001782
2.720	36.125	1.401	.4260	-.002362
2.880	36.310	.932	.4576	-.003253
3.040	36.429	.570	.4890	-.004734
3.200	36.498	.308	.5200	-.007475
3.360	36.532	.136	.5504	-.013393
3.520	36.545	.042	.5799	-.029910
3.680	36.549	.006	.6080	-.109439
3.840	36.549	.000	.6324	-13.908881
4.000	36.549	.002	.6540	.217478
4.160	36.551	.024	.6842	.052444
4.320	36.559	.093	.7192	.023759
4.480	36.585	.241	.7589	.013714
4.640	36.643	.510	.8036	.009007
4.800	36.757	.947	.8536	.006409
4.960	36.958	1.609	.9093	.004813
5.120	37.287	2.559	.9711	.003754
5.280	37.796	3.865	1.0390	.003007
5.440	38.547	5.600	1.1135	.002453
5.600	39.614	7.836	1.1944	.002025
5.760	41.085	10.648	1.2819	.001681
5.920	43.056	14.105	1.3759	.001397
6.080	45.637	18.277	1.4761	.001157
6.240	48.946	23.228	1.5826	.000951
6.400	53.115	29.026	1.6951	.000772
6.560	58.283	35.734	1.8135	.000616
6.720	64.602	43.425	1.9377	.000480
6.880	72.236	52.176	2.0679	.000360
7.040	81.360	62.076	2.2041	.000257
7.200	92.167	73.229	2.3466	.000166
7.360	104.866	85.754	2.4958	.000088
7.520	119.689	99.788	2.6521	.000019
7.680	136.887	115.486	2.8161	-.000042
7.840	156.742	133.022	2.9885	-.000098
8.000	179.563	152.588	3.1700	-.000150
8.160	205.690	174.392	3.3614	-.000200
8.320	235.500	198.661	3.5636	-.000251
8.480	269.406	225.639	3.7774	-.000304
8.640	307.863	255.589	4.0037	-.000361
8.800	351.368	288.794	4.2436	-.000423
8.960	400.467	325.563	4.4981	-.000491
9.120	455.756	366.228	4.7682	-.000568
9.280	517.887	411.154	5.0551	-.000653
9.440	587.573	460.739	5.3600	-.000749
9.600	665.595	515.419	5.6843	-.000856

Table 19. Continued

ISOBUTANE ISOTHERM AT 410.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	5.218	31.000	.0142	-.000004
.320	9.912	27.694	.0300	-.000015
.480	14.090	24.564	.0476	-.000035
.640	17.784	21.644	.0667	-.000062
.800	21.028	18.945	.0874	-.000098
.960	23.858	16.472	.1096	-.000142
1.120	26.311	14.220	.1332	-.000196
1.280	28.420	12.184	.1582	-.000259
1.440	30.221	10.355	.1844	-.000333
1.600	31.744	8.722	.2117	-.000419
1.760	33.021	7.272	.2400	-.000519
1.920	34.081	5.995	.2692	-.000637
2.080	34.948	4.877	.2991	-.000774
2.240	35.649	3.908	.3296	-.000934
2.400	36.206	3.077	.3604	-.001120
2.560	36.641	2.374	.3913	-.001331
2.720	36.973	1.791	.4222	-.001562
2.880	37.220	1.318	.4529	-.001790
3.040	37.400	.950	.4831	-.001968
3.200	37.529	.679	.5129	-.002019
3.360	37.622	.498	.5421	-.001858
3.520	37.693	.397	.5711	-.001448
3.680	37.752	.359	.6003	-.000833
3.840	37.810	.363	.6303	-.000098
4.000	37.869	.384	.6615	.000694
4.160	37.934	.438	.6945	.001488
4.320	38.013	.552	.7303	.002184
4.480	38.116	.756	.7695	.002676
4.640	38.261	1.088	.8132	.002913
4.800	38.473	1.596	.8620	.002921
4.960	38.784	2.333	.9165	.002768
5.120	39.236	3.362	.9772	.002530
5.280	39.879	4.749	1.0442	.002258
5.440	40.778	6.566	1.1179	.001986
5.600	42.007	8.885	1.1982	.001727
5.760	43.652	11.778	1.2851	.001487
5.920	45.811	15.316	1.3785	.001269
6.080	48.591	19.566	1.4784	.001070
6.240	52.113	24.595	1.5844	.000891
6.400	56.507	30.467	1.6966	.000730
6.560	61.911	37.249	1.8147	.000586
6.720	68.479	45.014	1.9387	.000457
6.880	76.372	53.839	2.0686	.000343
7.040	85.769	63.816	2.2046	.000243
7.200	96.861	75.050	2.3469	.000156
7.360	109.858	87.661	2.4959	.000079
7.520	124.993	101.788	2.6521	.000011
7.680	142.519	117.586	2.8160	-.000049
7.840	162.719	135.232	2.9883	-.000104
8.000	185.902	154.917	3.1697	-.000156
8.160	212.412	176.850	3.3610	-.000207
8.320	242.626	201.258	3.5631	-.000258
8.480	276.960	228.387	3.7768	-.000311
8.640	315.869	258.500	4.0030	-.000367
8.800	359.854	291.881	4.2428	-.000429
8.960	409.462	328.838	4.4971	-.000498
9.120	465.291	369.706	4.7670	-.000574
9.280	527.996	414.849	5.0538	-.000659
9.440	598.292	464.667	5.3585	-.000755
9.600	676.962	519.597	5.6825	-.000862

Table 19. Continued

ISOBUTANE ISOTHERM AT 420.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	5.360	31.937	.0141	-.000004
.320	10.212	28.733	.0299	-.000014
.480	14.564	25.703	.0472	-.000032
.640	18.448	22.880	.0661	-.000057
.800	21.897	20.274	.0865	-.000088
.960	24.947	17.890	.1082	-.000126
1.120	27.633	15.722	.1314	-.000171
1.280	29.990	13.764	.1558	-.000222
1.440	32.049	12.007	.1813	-.000278
1.600	33.842	10.438	.2079	-.000339
1.760	35.398	9.044	.2355	-.000404
1.920	36.745	7.812	.2638	-.000470
2.080	37.906	6.731	.2928	-.000536
2.240	38.906	5.788	.3223	-.000597
2.400	39.765	4.972	.3521	-.000650
2.560	40.503	4.275	.3821	-.000689
2.720	41.139	3.688	.4123	-.000708
2.880	41.689	3.207	.4425	-.000701
3.040	42.171	2.829	.4728	-.000663
3.200	42.600	2.553	.5032	-.000593
3.360	42.993	2.379	.5338	-.000490
3.520	43.366	2.302	.5650	-.000358
3.680	43.734	2.313	.5968	-.000202
3.840	44.110	2.390	.6298	-.000028
4.000	44.502	2.514	.6643	.000159
4.160	44.918	2.706	.7008	.000353
4.320	45.373	2.999	.7397	.000545
4.480	45.885	3.426	.7818	.000726
4.640	46.479	4.027	.8275	.000885
4.800	47.185	4.844	.8777	.001013
4.960	48.043	5.926	.9328	.001104
5.120	49.098	7.328	.9933	.001153
5.280	50.408	9.109	1.0598	.001163
5.440	52.037	11.332	1.1325	.001136
5.600	54.061	14.062	1.2116	.001079
5.760	56.567	17.365	1.2971	.000999
5.920	59.652	21.308	1.3891	.000903
6.080	63.423	25.954	1.4875	.000796
6.240	67.998	31.369	1.5922	.000686
6.400	73.506	37.620	1.7030	.000575
6.560	80.085	44.776	1.8199	.000467
6.720	87.887	52.913	1.9427	.000365
6.880	97.074	62.116	2.0716	.000271
7.040	107.826	72.483	2.2067	.000185
7.200	120.337	84.126	2.3482	.000107
7.360	134.821	97.171	2.4965	.000038
7.520	151.514	111.764	2.6520	-.000025
7.680	170.677	128.068	2.8154	-.000083
7.840	192.596	146.261	2.9871	-.000136
8.000	217.591	166.540	3.1680	-.000186
8.160	246.012	189.118	3.3588	-.000236
8.320	278.244	214.225	3.5604	-.000287
8.480	314.712	242.108	3.7735	-.000340
8.640	355.881	273.034	3.9992	-.000397
8.800	402.260	307.290	4.2383	-.000459
8.960	454.407	345.187	4.4920	-.000528
9.120	512.932	387.064	4.7612	-.000604
9.280	578.500	433.291	5.0470	-.000639
9.440	651.839	484.270	5.3508	-.000784

Table 19. Continued

ISOBUTANE ISOTHERM AT 450.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	5.782	34.722	.0140	-.000003
.320	11.103	31.801	.0295	-.000011
.480	15.968	29.045	.0464	-.000025
.640	20.408	26.488	.0646	-.000043
.800	24.455	24.139	.0842	-.000066
.960	28.143	22.000	.1050	-.000093
1.120	31.506	20.064	.1270	-.000124
1.280	34.574	18.324	.1502	-.000156
1.440	37.379	16.766	.1745	-.000191
1.600	39.949	15.378	.1997	-.000225
1.760	42.309	14.145	.2259	-.000259
1.920	44.483	13.054	.2529	-.000290
2.080	46.493	12.092	.2807	-.000318
2.240	48.358	11.249	.3091	-.000340
2.400	50.098	10.516	.3382	-.000354
2.560	51.729	9.888	.3678	-.000361
2.720	53.268	9.364	.3979	-.000357
2.880	54.731	8.946	.4286	-.000342
3.040	56.136	8.640	.4598	-.000316
3.200	57.502	8.456	.4917	-.000279
3.360	58.849	8.403	.5244	-.000230
3.520	60.199	8.489	.5580	-.000170
3.680	61.573	8.713	.5928	-.000102
3.840	62.994	9.063	.6291	-.000026
4.000	64.480	9.529	.6671	.000055
4.160	66.051	10.144	.7071	.000140
4.320	67.736	10.951	.7497	.000225
4.480	69.568	11.993	.7952	.000307
4.640	71.588	13.309	.8442	.000383
4.800	73.844	14.942	.8970	.000450
4.960	76.389	16.934	.9542	.000505
5.120	79.284	19.329	1.0163	.000546
5.280	82.598	22.171	1.0834	.000570
5.440	86.405	25.507	1.1561	.000577
5.600	90.789	29.383	1.2345	.000567
5.760	95.839	33.850	1.3188	.000542
5.920	101.655	38.958	1.4091	.000503
6.080	108.343	44.763	1.5054	.000452
6.240	116.019	51.326	1.6078	.000393
6.400	124.811	58.712	1.7161	.000328
6.560	134.855	66.999	1.8305	.000260
6.720	146.303	76.273	1.9508	.000192
6.880	159.321	86.633	2.0774	.000124
7.040	174.090	98.196	2.2103	.000060
7.200	190.814	111.090	2.3497	-.000001
7.360	209.718	125.463	2.4961	-.000058
7.520	231.050	141.477	2.6499	-.000112
7.680	255.087	159.310	2.8116	-.000162
7.840	282.137	179.157	2.9819	-.000211
8.000	312.536	201.224	3.1613	-.000259
8.160	346.659	225.735	3.3506	-.000308
8.320	384.914	252.930	3.5506	-.000358
8.480	427.753	283.064	3.7622	-.000411
8.640	475.666	316.412	3.9862	-.000468
8.800	529.192	353.271	4.2234	-.000530
8.960	588.918	393.963	4.4750	-.000598
9.120	655.483	438.838	4.7419	-.000674

96

Table 19. Continued

ISOBUTANE ISOTHERM AT 500.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	6.481	39.297	.0139	-.000002
.320	12.566	36.781	.0291	-.000008
.480	18.260	34.422	.0454	-.000017
.640	23.591	32.253	.0628	-.000029
.800	28.591	30.281	.0815	-.000044
.960	33.292	28.507	.1012	-.000061
1.120	37.724	26.923	.1220	-.000080
1.280	41.917	25.520	.1440	-.000100
1.440	45.899	24.283	.1669	-.000121
1.600	49.696	23.199	.1908	-.000141
1.760	53.330	22.252	.2158	-.000160
1.920	56.823	21.430	.2416	-.000178
2.080	60.194	20.722	.2684	-.000192
2.240	63.460	20.120	.2960	-.000204
2.400	66.637	19.618	.3246	-.000211
2.560	69.743	19.218	.3540	-.000214
2.720	72.793	18.925	.3843	-.000211
2.880	75.805	18.748	.4155	-.000203
3.040	78.799	18.704	.4477	-.000189
3.200	81.799	18.813	.4810	-.000169
3.360	84.829	19.097	.5155	-.000142
3.520	87.920	19.574	.5513	-.000111
3.680	91.103	20.255	.5886	-.000074
3.840	94.412	21.137	.6276	-.000034
4.000	97.878	22.225	.6685	.000009
4.160	101.538	23.568	.7116	.000054
4.320	105.436	25.219	.7573	.000099
4.480	109.627	27.229	.8058	.000143
4.640	114.171	29.644	.8575	.000183
4.800	119.137	32.503	.9128	.000219
4.960	124.598	35.846	.9721	.000248
5.120	130.635	39.706	1.0356	.000270
5.280	137.333	44.114	1.1036	.000282
5.440	144.782	49.098	1.1766	.000285
5.600	153.077	54.689	1.2547	.000278
5.760	162.317	60.917	1.3380	.000262
5.920	172.606	67.818	1.4268	.000238
6.080	184.057	75.437	1.5211	.000205
6.240	196.787	83.327	1.6211	.000167
6.400	210.926	93.056	1.7268	.000124
6.560	226.614	103.208	1.8384	.000078
6.720	244.007	114.381	1.9560	.000030
6.880	263.277	126.696	2.0797	-.000019
7.040	284.618	140.287	2.2098	-.000067
7.200	308.246	155.312	2.3466	-.000115
7.360	334.403	171.940	2.4904	-.000161
7.520	363.362	190.359	2.6418	-.000206
7.680	395.424	210.770	2.8011	-.000250
7.840	430.926	233.386	2.9690	-.000294
8.000	470.238	258.435	3.1461	-.000339
8.160	513.768	286.155	3.3331	-.000386
8.320	561.963	316.800	3.5307	-.000434
8.480	615.314	350.642	3.7396	-.000486
8.640	674.354	387.969	3.9607	-.000542

Table 19. Continued

ISOBUTANE ISOTHERM AT 550.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	7.175	43.812	.0138	-.000001
.320	14.010	41.644	.0287	-.000005
.480	20.510	39.629	.0447	-.000012
.640	26.701	37.800	.0616	-.000020
.800	32.616	36.166	.0796	-.000030
.960	38.285	34.725	.0987	-.000042
1.120	43.738	33.470	.1187	-.000055
1.280	49.004	32.390	.1398	-.000068
1.440	54.111	31.471	.1619	-.000082
1.600	59.083	30.700	.1850	-.000095
1.760	63.942	30.061	.2092	-.000108
1.920	68.709	29.544	.2343	-.000120
2.080	73.402	29.137	.2605	-.000130
2.240	78.038	28.835	.2877	-.000138
2.400	82.635	28.636	.3159	-.000143
2.560	87.208	28.545	.3452	-.000145
2.720	91.775	28.571	.3756	-.000144
2.880	96.358	28.731	.4071	-.000140
3.040	100.978	29.047	.4399	-.000132
3.200	105.662	29.546	.4739	-.000120
3.360	110.444	30.258	.5094	-.000104
3.520	115.358	31.210	.5464	-.000086
3.680	120.445	32.419	.5852	-.000064
3.840	125.746	33.891	.6257	-.000040
4.000	131.304	35.638	.6683	-.000014
4.160	137.168	37.723	.7132	.000013
4.320	143.397	40.209	.7606	.000040
4.480	150.059	43.151	.8108	.000065
4.640	157.232	46.598	.8641	.000089
4.800	165.000	50.592	.9208	.000109
4.960	173.453	55.170	.9811	.000125
5.120	182.687	60.359	1.0454	.000136
5.280	192.801	66.182	1.1139	.000141
5.440	203.900	72.660	1.1869	.000140
5.600	216.088	79.310	1.2646	.000132
5.760	229.476	87.654	1.3472	.000118
5.920	244.176	96.218	1.4349	.000098
6.080	260.306	105.541	1.5278	.000073
6.240	277.992	115.673	1.6261	.000043
6.400	297.369	126.684	1.7299	.000009
6.560	318.583	138.663	1.8395	-.000027
6.720	341.798	151.721	1.9549	-.000065
6.880	367.198	165.989	2.0764	-.000104
7.040	394.988	181.624	2.2044	-.000143
7.200	425.400	198.797	2.3390	-.000183
7.360	458.695	217.700	2.4807	-.000223
7.520	495.167	238.541	2.6300	-.000262
7.680	535.143	261.537	2.7872	-.000303
7.840	578.986	286.921	2.9530	-.000343
8.000	627.098	314.936	3.1279	-.000386
8.160	679.920	345.835	3.3126	-.000430

Table 19. Continued

ISOBUTANE ISOTHERM AT 600.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	7.866	48.284	.0138	-.000001
.320	15.441	46.425	.0285	-.000004
.480	22.730	44.719	.0442	-.000008
.640	29.761	43.199	.0608	-.000014
.800	36.564	41.876	.0784	-.000021
.960	43.172	40.748	.0969	-.000029
1.120	49.614	39.807	.1164	-.000038
1.280	55.919	39.043	.1370	-.000048
1.440	62.116	38.442	.1585	-.000057
1.600	68.229	37.991	.1810	-.000067
1.760	74.280	37.675	.2046	-.000076
1.920	80.292	37.484	.2293	-.000084
2.080	86.281	37.408	.2550	-.000091
2.240	92.268	37.444	.2819	-.000097
2.400	98.269	37.593	.3099	-.000101
2.560	104.304	37.860	.3390	-.000104
2.720	110.392	38.261	.3694	-.000104
2.880	116.556	38.814	.4011	-.000102
3.040	122.822	39.549	.4342	-.000098
3.200	129.223	40.497	.4687	-.000091
3.360	135.794	41.693	.5048	-.000082
3.520	142.579	43.171	.5426	-.000071
3.680	149.625	44.951	.5821	-.000058
3.840	156.981	47.046	.6236	-.000043
4.000	164.697	49.473	.6673	-.000028
4.160	172.834	52.309	.7132	-.000012
4.320	181.462	55.621	.7617	.000004
4.480	190.661	59.469	.8129	.000019
4.640	200.523	63.905	.8670	.000032
4.800	211.145	68.974	.9245	.000043
4.960	222.630	74.710	.9854	.000051
5.120	235.089	81.141	1.0500	.000056
5.280	248.633	88.283	1.1187	.000056
5.440	263.378	96.152	1.1915	.000052
5.600	279.441	104.760	1.2688	.000043
5.760	296.942	114.121	1.3507	.000030
5.920	316.002	124.259	1.4375	.000012
6.080	336.748	135.207	1.5292	-.000009
6.240	359.314	147.017	1.6261	-.000034
6.400	383.843	159.761	1.7285	-.000062
6.560	410.492	173.532	1.8364	-.000092
6.720	439.435	188.452	1.9501	-.000124
6.880	470.866	204.564	2.0698	-.000157
7.040	505.005	222.337	2.1959	-.000191
7.200	542.101	241.659	2.3287	-.000225
7.360	582.435	262.839	2.4636	-.000260
7.520	626.321	286.098	2.6159	-.000296
7.680	674.110	311.672	2.7712	-.000333

Table 19. Continued

ISOBUTANE ISOTHERM AT 700.00 DEG. K

MOL/L	P,BAR	DP/DD	DP/DT	D2P/DT2
.160	9.240	57.147	.0137	-.000000
.320	18.277	55.831	.0282	-.000002
.480	27.115	54.675	.0436	-.000004
.640	35.784	53.717	.0598	-.000007
.800	44.316	52.968	.0768	-.000011
.960	52.744	52.426	.0948	-.000015
1.120	61.103	52.087	.1136	-.000020
1.280	69.423	51.940	.1335	-.000025
1.440	77.733	51.972	.1543	-.000030
1.600	86.062	52.171	.1762	-.000035
1.760	94.436	52.524	.1991	-.000040
1.920	102.878	53.023	.2231	-.000045
2.080	111.411	53.660	.2483	-.000049
2.240	120.057	54.435	.2746	-.000053
2.400	128.838	55.352	.3023	-.000057
2.560	137.777	56.421	.3312	-.000059
2.720	146.902	57.663	.3615	-.000061
2.880	156.240	59.102	.3932	-.000061
3.040	165.827	60.773	.4265	-.000061
3.200	175.702	62.717	.4614	-.000060
3.360	185.913	64.975	.4980	-.000057
3.520	196.513	67.587	.5364	-.000055
3.680	207.561	70.581	.5767	-.000051
3.840	219.120	73.973	.6191	-.000047
4.000	231.255	77.795	.6637	-.000042
4.160	244.042	82.137	.7105	-.000038
4.320	257.571	87.077	.7599	-.000033
4.480	271.942	92.681	.8120	-.000030
4.640	287.268	99.011	.8669	-.000027
4.800	303.667	106.112	.9248	-.000026
4.960	321.267	114.022	.9861	-.000027
5.120	340.198	122.766	1.0508	-.000029
5.280	360.597	132.361	1.1191	-.000034
5.440	382.600	142.817	1.1914	-.000041
5.600	406.345	154.141	1.2677	-.000051
5.760	431.972	166.346	1.3484	-.000064
5.920	459.624	179.450	1.4335	-.000078
6.080	489.446	193.489	1.5233	-.000096
6.240	521.593	208.516	1.6181	-.000115
6.400	556.228	224.610	1.7180	-.000136
6.560	593.530	241.877	1.8233	-.000159
6.720	633.698	260.454	1.9342	-.000184
6.880	676.954	280.502	2.0511	-.000210

Table 20. The Joule–Thomson inversion locus

THE JOULE–THOMSON INVERSION LOCUS FOR I-BUTANE

T,K	P,BAR	MOL/L	T,K	P,BAR	MOL/L
350	64.6	8.58	610	395.5	6.37
360	89.9	8.49	620	399.0	6.28
370	114.0	8.41	630	402.4	6.21
380	136.9	8.33	640	405.7	6.13
390	158.7	8.25	650	408.8	6.05
400	179.3	8.16	660	411.7	5.98
410	198.8	8.08	670	414.6	5.91
420	217.2	8.00	680	417.4	5.84
430	234.5	7.91	690	420.1	5.77
440	250.8	7.83	700	422.7	5.70
450	266.1	7.75	710	425.2	5.64
460	280.3	7.66	720	427.5	5.57
470	293.6	7.58	730	429.8	5.51
480	305.9	7.49	740	431.9	5.45
490	317.2	7.41	750	433.9	5.39
500	327.6	7.32	760	435.8	5.33
510	337.1	7.23	770	437.5	5.27
520	345.3	7.14	780	439.1	5.21
530	353.6	7.06	790	440.5	5.16
540	360.8	6.97	800	441.7	5.10
550	367.2	6.88	810	442.8	5.04
560	373.0	6.79	820	443.6	4.99
570	378.3	6.70	830	444.3	4.93
580	383.2	6.62	840	444.8	4.88
590	387.6	6.53	850	445.0	4.82
600	391.7	6.45	860	445.1	4.76

TABLE 21. Thermophysical properties of the saturated liquid

This table was computed along paths described in section 3.0. Column headings have the following interpretations--

DPS/DT	$\equiv$	dP_σ/dT, vapor pressure,
DDL/DT	$\equiv$	$d\rho_\ell/dT$, saturated liquid,
DP/DT	$\equiv$	$(\partial P/\partial T)$, single phase,
DP/DD	$\equiv$	$(\partial P/\partial\rho)$, single phase,
Q,VAP	$\equiv$	ΔH_{vap}, heat of vaporization,
CV	$\equiv$	$C_v(\rho,T)$,
CS	$\equiv$	$C_\sigma(T)$,
CP	$\equiv$	$C_p(\rho,T)$,
W	$\equiv$	speed of sound.

Table 21. Thermophysical properties of saturated liquid

PROPERTIES OF SATURATED LIQUID I-BUTANE

T DEG K	P BAR	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CS J/MOL/K	CP J/MOL/K	W M/SEC
113.550	.1889E-06	.0	.0	108.255	73.23	98.82	98.82	1776
120.000	.9330E-06	641.1	641.1	113.748	73.81	99.84	99.84	1728
130.000	.7879E-05	1647.7	1647.7	121.805	74.85	101.49	101.49	1658
140.000	.4757E-04	2670.9	2670.9	129.388	76.01	103.24	103.24	1591
150.000	.2201E-03	3711.7	3711.7	136.571	77.29	105.06	105.06	1528
160.000	.8224E-03	4771.0	4771.0	143.413	78.68	106.98	106.98	1467
170.000	.2580E-02	5849.5	5849.5	149.958	80.16	108.97	108.97	1409
180.000	.7012E-02	6948.1	6948.2	156.244	81.73	111.05	111.05	1353
190.000	.1690E-01	8067.9	8068.1	162.304	83.37	113.21	113.21	1298
200.000	.3685E-01	9210.1	9210.4	168.165	85.07	115.45	115.45	1245
210.000	.7380E-01	10375.9	10376.6	173.852	86.83	117.77	117.79	1194
220.000	.1374E+00	11566.9	11568.1	179.386	88.64	120.18	120.21	1143
230.000	.2405E+00	12784.3	12786.6	184.785	90.49	122.69	122.73	1094
240.000	.3989E+00	14029.4	14033.1	190.065	92.37	125.28	125.36	1045
250.000	.6315E+00	15302.8	15308.8	195.238	94.27	127.99	128.10	997
261.359	.1013E+01	16784.1	16794.0	200.999	96.46	131.19	131.39	943
270.000	.1408E+01	17936.1	17950.1	205.309	98.14	133.74	134.02	902
280.000	.2002E+01	19297.0	19317.3	210.227	100.10	136.83	137.23	855
290.000	.2769E+01	20688.0	20716.7	215.081	102.05	140.10	140.66	809
300.000	.3736E+01	22111.0	22150.6	219.882	104.02	143.56	144.37	762
310.000	.4934E+01	23568.2	23621.8	224.644	105.98	147.29	148.42	715
320.000	.6392E+01	25062.9	25134.1	229.378	107.94	151.33	152.91	667
330.000	.8140E+01	26598.8	26692.1	234.101	109.90	155.80	158.01	619
340.000	.1021E+02	28181.6	28302.2	238.828	111.87	160.85	163.95	571
350.000	.1264E+02	29818.3	29972.7	243.580	113.85	166.72	171.15	521
360.000	.1546E+02	31518.1	31714.6	248.383	115.88	173.84	180.31	469
370.000	.1872E+02	33295.4	33544.5	253.273	118.03	183.00	192.94	414
380.000	.2248E+02	35174.5	35490.8	258.314	120.50	195.93	212.51	355
390.000	.2682E+02	37204.6	37610.6	263.637	123.58	217.49	249.86	287
400.000	.3186E+02	39541.3	40081.9	269.662	127.80	270.55	370.22	206
408.000	.3655E+02	42792.3	43739.2	278.446	0.00	0.00	0.00	0

Table 21. Continued

PROPERTIES OF SATURATED LIQUID I-BUTANE

T	P	DEN	V,LIQ	V,GAS	DPS/DT	DDL/DT	DP/DT	DP/DD	Q,VAP
DEG K	BAR	MCL/L	L/MOL	L/MOL	BAR/K	MOL/L/K	BAR/K	BAR-L/MOL	J/MOL
113.550	.1889E-06	12.755	.07840	.4997E+08	.4970E-07	-.01643	22.319	.1359E+04	28208
120.000	.9330E-06	12.649	.07906	.1069E+08	.2174E-06	-.01644	21.107	.1284E+04	27901
130.000	.7879E-05	12.485	.08010	.1372E+07	.1538E-05	-.01646	19.406	.1179E+04	27434
140.000	.4757E-04	12.320	.08117	.2447E+06	.7873E-05	-.01650	17.890	.1084E+04	26976
150.000	.2201E-03	12.155	.08227	.5665E+05	.3120E-04	-.01655	16.529	.9988E+03	26526
160.000	.8224E-03	11.989	.08341	.1617E+05	.1007E-03	-.01661	15.299	.9208E+03	26081
170.000	.2580E-02	11.822	.08459	.5473E+04	.2753E-03	-.01670	14.182	.8492E+03	25638
180.000	.7012E-02	11.655	.08580	.2131E+04	.6565E-03	-.01681	13.163	.7831E+03	25197
190.000	.1690E-01	11.486	.08706	.9316E+03	.1398E-02	-.01694	12.229	.7217E+03	24755
200.000	.3685E-01	11.316	.08837	.4489E+03	.2707E-02	-.01711	11.369	.6645E+03	24308
210.000	.7380E-01	11.144	.08974	.2348E+03	.4843E-02	-.01730	10.574	.6109E+03	23856
220.000	.1374E+00	10.970	.09116	.1316E+03	.8098E-02	-.01754	9.838	.5605E+03	23395
230.000	.2405E+00	10.793	.09265	.7831E+02	.1278E-01	-.01782	9.153	.5130E+03	22923
240.000	.3989E+00	10.613	.09422	.4901E+02	.1921E-01	-.01815	8.514	.4681E+03	22436
250.000	.6315E+00	10.430	.09588	.3203E+02	.2767E-01	-.01853	7.915	.4256E+03	21933
261.359	.1013E+01	10.216	.09788	.2066E+02	.4006E-01	-.01905	7.279	.3799E+03	21335
270.000	.1408E+01	10.050	.09951	.1521E+02	.5166E-01	-.01952	6.823	.3469E+03	20859
280.000	.2002E+01	9.851	.10151	.1094E+02	.6756E-01	-.02014	6.322	.3106E+03	20282
290.000	.2769E+01	9.646	.10366	.8052E+01	.8625E-01	-.02087	5.848	.2760E+03	19672
300.000	.3736E+01	9.434	.10600	.6044E+01	.1078E+00	-.02174	5.396	.2433E+03	19022
310.000	.4934E+01	9.211	.10856	.4613E+01	.1323E+00	-.02277	4.966	.2123E+03	18327
320.000	.6392E+01	8.977	.11139	.3571E+01	.1598E+00	-.02401	4.552	.1830E+03	17578
330.000	.8140E+01	8.730	.11455	.2795E+01	.1903E+00	-.02552	4.155	.1554E+03	16765
340.000	.1021E+02	8.466	.11812	.2207E+01	.2242E+00	-.02740	3.769	.1294E+03	15875
350.000	.1264E+02	8.180	.12224	.1752E+01	.2617E+00	-.02980	3.392	.1050E+03	14888
360.000	.1546E+02	7.867	.12711	.1394E+01	.3033E+00	-.03301	3.019	.8228E+02	13779
370.000	.1872E+02	7.516	.13305	.1107E+01	.3500E+00	-.03753	2.644	.6111E+02	12505
380.000	.2248E+02	7.108	.14068	.8700E+00	.4035E+00	-.04455	2.255	.4156E+02	10995
390.000	.2682E+02	6.606	.15137	.6684E+00	.4666E+00	-.05743	1.835	.2382E+02	9102
400.000	.3186E+02	5.893	.16970	.4843E+00	.5453E+00	-.09306	1.344	.8577E+01	6396
408.000	.3655E+02	3.860	.25907	.2591E+00	.6341E+00	0.00000	.634	0.	0

TABLE 22. Thermophysical properties along isobars[*]

The following pages give physical and thermodynamic properties along selected isobars, as computed by methods of section 3 of the text.

The first line of each table refers to freezing liquid on the P(T) melting line.

Each table at $P < P_c$ contains a blank line for the transition from saturated liquid to vapor, as seen by the abrupt decrease of density.

Table headings for partial derivatives have the following interpretations--

DP/DT ≡ ∂P/∂T,

DP/DD ≡ ∂P/∂ρ.

The specific heat interpretations are--

CV ≡ $C_v(\rho,T)$,

CP ≡ $C_p(\rho,T)$.

[*]These tables are extrapolated beyond the range of some of the P-ρ-T data used for adjusting the equation of state. Small discontinuities may be detected at T = 408.0 K along isobars at $P > P_c$ = 36.55 bar, due to change in the paths of computation, section 3.

Table 22. Thermophysical properties along isobars

I-BUTANE ISOBAR AT P = .10000 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MCL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.554	12.755	.07840	22.3189	1358.694	.3	1.1	108.262	73.23	98.82	1776
120.000	12.649	.07906	21.1077	1284.130	640.9	641.7	113.745	73.81	99.84	1728
130.000	12.485	.08010	19.4071	1178.930	1647.6	1648.4	121.801	74.85	101.49	1658
140.000	12.320	.08117	17.8909	1084.471	2670.8	2671.6	129.386	76.01	103.23	1591
150.000	12.155	.08227	16.5296	998.945	3711.6	3712.5	136.570	77.29	105.06	1528
160.000	11.989	.08341	15.2999	920.938	4770.9	4771.8	143.411	78.68	106.97	1467
170.000	11.822	.08459	14.1831	849.324	5849.7	5850.6	149.956	80.16	108.97	1409
180.000	11.655	.08580	13.1637	783.186	6949.0	6949.9	156.243	81.73	111.05	1353
190.000	11.486	.08706	12.2294	721.795	8069.8	8070.7	162.304	83.37	113.21	1298
200.000	11.316	.08837	11.3693	664.534	9213.0	9213.9	168.168	85.07	115.45	1245
210.000	11.144	.08974	10.5747	610.896	10379.8	10380.7	173.857	86.83	117.79	1194
214.751	11.061	.09041	10.2178	586.554	10938.6	10939.5	176.499	87.68	118.93	1169
214.751	.00565	176.924	.000473	17.570	32808.4	34577.6	286.571	67.03	75.60	184
220.000	.00551	181.348	.000462	18.018	33164.1	34977.6	288.412	68.27	76.82	186
230.000	.00527	189.766	.000441	18.869	33860.0	35757.7	291.879	70.67	79.20	190
240.000	.00505	198.171	.000422	19.717	34580.1	36561.8	295.300	73.13	81.64	194
250.000	.00484	206.567	.000404	20.564	35324.9	37390.6	298.683	75.65	84.13	198
260.000	.00465	214.954	.000388	21.409	36095.0	38244.6	302.033	78.22	86.69	202
270.000	.00448	223.334	.000374	22.253	36891.1	39124.4	305.353	80.83	89.29	205
280.000	.00432	231.708	.000360	23.095	37713.4	40030.4	308.648	83.49	91.93	209
290.000	.00417	240.076	.000347	23.937	38562.3	40963.1	311.920	86.18	94.61	212
300.000	.00403	248.439	.000336	24.777	39438.3	41922.7	315.173	88.90	97.31	216
310.000	.00389	256.798	.000325	25.617	40341.5	42909.4	318.408	91.63	100.04	219
320.000	.00377	265.153	.000314	26.456	41272.0	43923.5	321.628	94.38	102.78	222
330.000	.00366	273.505	.000305	27.294	42230.0	44965.0	324.832	97.13	105.52	225
340.000	.00355	281.854	.000296	28.132	43215.4	46034.0	328.023	99.88	108.27	229
350.000	.00345	290.201	.000287	28.969	44228.3	47130.3	331.201	102.62	111.01	232
360.000	.00335	298.545	.000279	29.805	45268.6	48254.1	334.367	105.36	113.74	235
370.000	.00326	306.886	.000271	30.642	46336.2	49405.0	337.520	108.08	116.45	238
380.000	.00317	315.226	.000264	31.478	47430.8	50583.0	340.662	110.78	119.15	241
390.000	.00309	323.565	.000257	32.313	48552.3	51787.9	343.791	113.45	121.82	244
400.000	.00301	331.901	.000251	33.149	49700.4	53019.4	346.909	116.11	124.47	247
410.000	.00294	340.237	.000245	33.984	50874.8	54277.2	350.015	118.73	127.09	250
420.000	.00287	348.570	.000239	34.819	52075.4	55561.0	353.108	121.32	129.68	253
430.000	.00280	356.903	.000233	35.653	53301.7	56870.8	356.190	123.89	132.24	255
440.000	.00274	365.235	.000228	36.488	54553.5	58205.9	359.259	126.42	134.77	258
450.000	.00268	373.566	.000223	37.322	55830.4	59566.1	362.316	128.91	137.27	261
460.000	.00262	381.896	.000218	38.156	57132.1	60951.1	365.360	131.38	139.73	264
470.000	.00256	390.225	.000213	38.990	58458.2	62360.5	368.391	133.80	142.15	266
480.000	.00251	398.553	.000209	39.824	59808.4	63794.0	371.409	136.19	144.54	269
490.000	.00246	406.880	.000205	40.658	61182.3	65251.1	374.413	138.55	146.89	272
500.000	.00241	415.207	.000200	41.491	62579.6	66731.6	377.404	140.86	149.21	274
520.000	.00232	431.859	.000193	43.158	65442.7	69761.3	383.345	145.39	153.73	280
540.000	.00223	448.510	.000185	44.825	68394.8	72879.9	389.229	149.77	158.11	285
560.000	.00215	465.158	.000179	46.491	71433.1	76084.7	395.056	154.01	162.35	290
580.000	.00208	481.805	.000173	48.157	74554.9	79372.9	400.825	158.11	166.45	295
600.000	.00201	498.450	.000167	49.822	77757.3	82741.8	406.535	162.08	170.42	300
620.000	.00194	515.094	.000161	51.488	81037.7	86188.7	412.186	165.92	174.25	305
640.000	.00188	531.737	.000156	53.153	84393.7	89711.0	417.777	169.63	177.96	309
660.000	.00182	548.380	.000152	54.818	87822.6	93306.4	423.303	173.23	181.56	314
680.000	.00177	565.021	.000147	56.483	91322.3	96972.5	428.781	176.70	185.03	318
700.000	.00172	581.662	.000143	58.148	94890.4	100707.0	434.193	180.07	188.40	323

Table 22. Continued

I-BUTANE ISOBAR AT P = .50000 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.572	12.755	.07840	22.3190	1358.915	1.6	5.5	108.273	73.23	98.82	1776
120.000	12.649	.07906	21.1111	1284.549	640.4	644.3	113.741	73.81	99.83	1728
130.000	12.485	.08010	19.4104	1179.336	1647.0	1651.0	121.797	74.85	101.49	1658
140.000	12.320	.08117	17.8941	1084.866	2670.2	2674.3	129.381	76.01	103.23	1592
150.000	12.155	.08227	16.5327	999.331	3711.0	3715.1	136.565	77.29	105.06	1528
160.000	11.989	.08341	15.3030	921.317	4770.2	4774.4	143.406	78.68	106.97	1468
170.000	11.823	.08458	14.1861	849.698	5848.9	5853.1	149.951	80.16	108.97	1409
180.000	11.655	.08580	13.1667	783.556	6948.1	6952.4	156.238	81.73	111.04	1353
190.000	11.487	.08706	12.2323	722.161	8068.8	8073.2	162.299	83.37	113.20	1298
200.000	11.316	.08837	11.3722	664.898	9212.0	9216.4	168.162	85.07	115.45	1245
210.000	11.144	.08973	10.5776	611.259	10378.6	10383.1	173.851	86.83	117.78	1194
220.000	10.970	.09116	9.8406	560.821	11569.8	11574.3	179.386	88.64	120.20	1143
230.000	10.793	.09265	9.1548	513.228	12786.5	12791.2	184.785	90.49	122.73	1094
240.000	10.613	.09422	8.5142	468.185	14029.9	14034.7	190.063	92.37	125.36	1045
244.798	10.526	.09501	8.2215	447.403	14636.8	14641.5	192.559	93.28	126.66	1022
244.798	.02515	39.766	.002146	19.473	34850.1	36838.4	283.234	74.66	83.81	193
250.000	.02459	40.671	.002095	19.947	35244.0	37277.6	285.009	75.94	85.04	196
260.000	.02358	42.403	.002004	20.849	36019.9	38140.1	288.391	78.47	87.48	199
270.000	.02266	44.128	.001921	21.743	36820.9	39027.3	291.740	81.06	89.99	203
280.000	.02181	45.845	.001846	22.630	37647.7	39939.9	295.059	83.69	92.55	207
290.000	.02103	47.557	.001776	23.510	38500.6	40878.4	298.352	86.36	95.17	211
300.000	.02030	49.263	.001712	24.385	39380.2	41843.3	301.623	89.06	97.82	214
310.000	.01962	50.965	.001653	25.256	40286.6	42834.9	304.874	91.78	100.50	218
320.000	.01899	52.664	.001598	26.123	41220.1	43853.3	308.107	94.52	103.19	221.
330.000	.01840	54.359	.001547	26.987	42180.8	44898.7	311.324	97.26	105.90	224
340.000	.01784	56.051	.001499	27.847	43168.7	45971.2	314.526	100.00	108.61	228
350.000	.01732	57.741	.001454	28.705	44183.9	47070.9	317.713	102.73	111.32	231
360.000	.01683	59.428	.001411	29.561	45226.3	48197.7	320.887	105.46	114.03	234
370.000	.01636	61.113	.001372	30.414	46295.7	49351.4	324.048	108.17	116.72	237
380.000	.01592	62.797	.001334	31.266	47392.1	50532.0	327.196	110.86	119.39	240
390.000	.01551	64.479	.001299	32.116	48515.2	51739.2	330.332	113.53	122.05	243
400.000	.01512	66.159	.001265	32.964	49664.9	52972.8	333.455	116.18	124.68	246
410.000	.01474	67.838	.001233	33.812	50840.8	54232.7	336.566	118.80	127.29	249
420.000	.01439	69.516	.001203	34.658	52042.6	55518.4	339.664	121.39	129.86	252
430.000	.01405	71.193	.001174	35.502	53270.2	56829.8	342.750	123.95	132.41	255
440.000	.01372	72.869	.001147	36.346	54523.1	58166.6	345.823	126.47	134.93	258
450.000	.01341	74.544	.001121	37.190	55801.3	59528.3	348.883	128.97	137.41	261
460.000	.01312	76.219	.001096	38.032	57103.8	60914.7	351.930	131.42	139.86	263
470.000	.01284	77.891	.001072	38.873	58430.8	62325.4	354.964	133.85	142.28	266
480.000	.01257	79.564	.001049	39.714	59781.9	63760.1	357.984	136.23	144.66	269
490.000	.01231	81.236	.001027	40.555	61156.6	65218.4	360.991	138.58	147.00	272
500.000	.01206	82.908	.001007	41.394	62554.6	66700.0	363.984	140.90	149.31	274
520.000	.01159	86.250	.000967	43.072	65419.1	69731.5	369.929	145.42	153.82	279
540.000	.01116	89.590	.000931	44.749	68372.4	72851.9	375.817	149.80	158.19	285
560.000	.01076	92.929	.000897	46.424	71411.8	76058.3	381.647	154.04	162.42	290
580.000	.01039	96.266	.000866	48.097	74534.5	79347.8	387.418	158.14	166.51	295
600.000	.01004	99.602	.000837	49.770	77737.9	82717.9	393.130	162.10	170.47	300
620.000	.00971	102.938	.000810	51.442	81019.1	86165.9	398.783	165.94	174.31	304
640.000	.00941	106.272	.000784	53.112	84375.7	89689.3	404.376	169.65	178.01	309
660.000	.00912	109.606	.000760	54.783	87805.3	93285.6	409.909	173.24	181.60	314
680.000	.00885	112.940	.000738	56.452	91305.6	96952.5	415.332	176.71	185.07	318
700.000	.00860	116.272	.000716	58.121	94874.2	100687.8	420.795	180.08	188.43	323

Table 22. Continued

I-BUTANE ISOBAR AT P = 1.01325 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.594	12.755	.07840	22.3191	1359.198	3.2	11.1	108.287	73.23	98.82	1776
120.000	12.650	.07905	21.1155	1285.086	639.7	647.8	113.736	73.81	99.83	1729
130.000	12.485	.08009	19.4146	1179.857	1646.3	1654.4	121.791	74.85	101.49	1659
140.000	12.321	.08116	17.8982	1085.373	2669.4	2677.7	129.376	76.01	103.23	1592
150.000	12.156	.08227	16.5367	999.827	3710.1	3718.4	136.560	77.29	105.06	1529
160.000	11.990	.08340	15.3069	921.804	4769.2	4777.7	143.400	78.68	106.97	1468
170.000	11.823	.08458	14.1899	850.178	5847.9	5856.4	149.945	80.16	108.96	1410
180.000	11.656	.08579	13.1705	784.030	6947.0	6955.7	156.231	81.73	111.04	1353
190.000	11.487	.08705	12.2360	722.632	8067.6	8076.4	162.293	83.37	113.20	1299
200.000	11.317	.08836	11.3760	665.366	9210.6	9219.6	168.156	85.07	115.44	1246
210.000	11.145	.08972	10.5813	611.726	10377.1	10386.2	173.844	86.83	117.77	1194
220.000	10.971	.09115	9.8443	561.287	11568.1	11577.4	179.379	88.64	120.20	1144
230.000	10.794	.09264	9.1585	513.696	12784.7	12794.1	184.777	90.49	122.72	1094
240.000	10.614	.09421	8.5180	468.654	14028.0	14037.5	190.055	92.37	125.35	1046
250.000	10.431	.09587	7.9177	425.916	15299.1	15308.8	195.227	94.27	128.09	997
260.000	10.242	.09763	7.3531	385.273	16599.3	16609.2	200.307	96.20	130.98	949
261.359	10.216	.09788	7.2789	379.901	16784.1	16794.0	200.999	96.46	131.39	943
261.359	.04840	20.663	.004209	20.169	36035.5	38129.2	282.631	79.21	89.02	197
270.000	.04666	21.430	.004041	21.009	36735.6	38907.0	285.559	81.39	91.03	201
280.000	.04482	22.309	.003865	21.964	37568.8	39829.3	288.913	83.98	93.46	205
290.000	.04314	23.182	.003706	22.905	38427.4	40776.3	292.236	86.62	95.97	208
300.000	.04158	24.048	.003562	23.833	39312.0	41748.7	295.532	89.29	98.53	212
310.000	.04014	24.910	.003429	24.751	40222.8	42746.9	298.805	91.99	101.13	216
320.000	.03881	25.768	.003307	25.660	41160.3	43771.3	302.058	94.71	103.76	219
330.000	.03756	26.622	.003195	26.561	42124.6	44822.1	305.291	97.43	106.42	223
340.000	.03640	27.473	.003090	27.456	43115.8	45899.6	308.508	100.16	109.08	226
350.000	.03531	28.321	.002993	28.345	44134.0	47003.7	311.708	102.88	111.75	230
360.000	.03429	29.167	.002902	29.229	45179.1	48134.5	314.894	105.59	114.42	233
370.000	.03332	30.010	.002816	30.108	46251.1	49291.9	318.065	108.30	117.07	236
380.000	.03241	30.852	.002736	30.983	47349.8	50475.8	321.222	110.98	119.72	239
390.000	.03155	31.692	.002661	31.854	48475.0	51686.2	324.366	113.64	122.35	242
400.000	.03074	32.530	.002590	32.722	49626.6	52922.7	327.496	116.28	124.96	245
410.000	.02997	33.367	.002523	33.588	50804.2	54185.2	330.614	118.89	127.54	248
420.000	.02924	34.203	.002459	34.450	52007.8	55473.4	333.718	121.47	130.10	251
430.000	.02854	35.037	.002399	35.311	53236.9	56787.0	336.809	124.03	132.63	254
440.000	.02788	35.871	.002342	36.169	54491.2	58125.8	339.887	126.55	135.13	257
450.000	.02725	36.703	.002287	37.025	55770.5	59489.5	342.951	129.03	137.60	260
460.000	.02664	37.535	.002235	37.880	57074.4	60877.6	346.002	131.49	140.04	263
470.000	.02606	38.366	.002186	38.733	58402.6	62290.0	349.040	133.91	142.44	266
480.000	.02551	39.196	.002139	39.585	59754.7	63726.3	352.063	136.29	144.81	268
490.000	.02498	40.026	.002093	40.435	61130.4	65186.0	355.073	138.64	147.14	271
500.000	.02448	40.855	.002050	41.284	62529.3	66669.0	358.069	140.95	149.44	274
520.000	.02352	42.512	.001969	42.979	65395.5	69703.0	364.018	145.46	153.94	279
540.000	.02264	44.167	.001894	44.670	68350.3	72825.5	369.910	149.83	158.29	284
560.000	.02182	45.821	.001825	46.358	71391.0	76033.8	375.744	154.07	162.51	290
580.000	.02106	47.473	.001760	48.043	74514.8	79325.0	381.518	158.16	166.59	295
600.000	.02036	49.124	.001701	49.726	77719.1	82696.6	387.233	162.12	170.55	299
620.000	.01970	50.774	.001645	51.407	81001.3	86145.9	392.888	165.96	174.37	304
640.000	.01908	52.423	.001593	53.087	84358.7	89670.5	398.482	169.67	178.07	309
660.000	.01849	54.072	.001544	54.765	87789.0	93267.9	404.017	173.25	181.65	314
680.000	.01795	55.720	.001498	56.441	91289.0	96935.8	409.492	176.73	185.12	318
700.000	.01743	57.368	.001454	58.117	94859.1	100671.9	414.906	180.09	188.48	323

Table 22. Continued

I-BUTANE ISOBAR AT P = 1.50000 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.615	12.755	.07840	22.3192	1359.465	4.7	16.5	108.300	73.23	98.82	1776
120.000	12.650	.07905	21.1196	1285.596	639.1	651.0	113.731	73.81	99.83	1729
130.000	12.486	.08009	19.4186	1180.351	1645.7	1657.7	121.786	74.85	101.49	1659
140.000	12.321	.08116	17.9021	1085.854	2668.7	2680.9	129.370	76.01	103.23	1592
150.000	12.156	.08226	16.5405	1000.297	3709.3	3721.6	136.554	77.29	105.06	1529
160.000	11.990	.08340	15.3106	922.265	4768.3	4780.9	143.395	78.68	106.97	1468
170.000	11.824	.08457	14.1936	850.632	5846.9	5859.6	149.939	80.16	108.96	1410
180.000	11.657	.08579	13.1741	784.480	6945.9	6958.8	156.225	81.73	111.04	1354
190.000	11.488	.08705	12.2396	723.078	8066.4	8079.4	162.286	83.37	113.19	1299
200.000	11.318	.08836	11.3795	665.810	9209.3	9222.6	168.149	85.07	115.44	1246
210.000	11.146	.08972	10.5848	612.168	10375.7	10389.2	173.837	86.83	117.77	1195
220.000	10.972	.09114	9.8479	561.730	11566.6	11580.2	179.371	88.64	120.19	1144
230.000	10.795	.09263	9.1620	514.139	12783.0	12796.9	184.769	90.49	122.71	1095
240.000	10.615	.09420	8.5215	469.100	14026.1	14040.2	190.047	92.37	125.34	1046
250.000	10.432	.09586	7.9213	426.364	15297.0	15311.4	195.219	94.27	128.08	998
260.000	10.244	.09762	7.3567	385.725	16597.0	16611.6	200.298	96.20	130.97	950
270.000	10.050	.09950	6.8237	347.009	17927.6	17942.5	205.297	98.14	134.01	902
271.735	10.016	.09984	6.7341	340.475	18170.1	18185.1	206.167	98.48	134.56	894
271.735	.06974	14.339	.006161	20.405	36795.9	38946.6	282.571	82.21	92.60	198
280.000	.06735	14.849	.005915	21.255	37492.1	39719.4	285.372	84.29	94.46	202
290.000	.06469	15.459	.005650	22.261	38356.8	40675.6	288.728	86.89	96.82	206
300.000	.06226	16.062	.005411	23.246	39246.6	41656.0	292.052	89.53	99.28	210
310.000	.06002	16.660	.005196	24.213	40162.2	42661.2	295.348	92.20	101.79	214
320.000	.05796	17.254	.004999	25.166	41103.8	43691.8	298.620	94.89	104.35	218
330.000	.05604	17.843	.004819	26.107	42071.8	44748.3	301.871	97.60	106.95	221
340.000	.05426	18.429	.004653	27.038	43066.3	45830.7	305.102	100.31	109.56	225
350.000	.05260	19.012	.004499	27.958	44087.5	46939.4	308.316	103.02	112.18	228
360.000	.05104	19.593	.004356	28.871	45135.4	48074.3	311.513	105.72	114.81	232
370.000	.04958	20.171	.004223	29.777	46210.0	49235.6	314.694	108.42	117.43	235
380.000	.04820	20.747	.004099	30.676	47310.9	50422.9	317.861	111.09	120.05	238
390.000	.04690	21.321	.003982	31.570	48438.2	51636.4	321.013	113.74	122.65	242
400.000	.04568	21.894	.003873	32.458	49591.7	52875.8	324.150	116.37	125.23	245
410.000	.04451	22.465	.003769	33.342	50771.1	54140.9	327.274	118.98	127.79	248
420.000	.04341	23.035	.003672	34.222	51976.3	55431.5	330.384	121.55	130.33	251
430.000	.04237	23.604	.003579	35.059	53206.9	56747.4	333.481	124.10	132.85	254
440.000	.04137	24.171	.003492	35.972	54462.6	58088.3	336.563	126.62	135.33	257
450.000	.04042	24.738	.003409	36.842	55743.2	59453.8	339.632	129.10	137.79	260
460.000	.03952	25.304	.003330	37.709	57048.2	60843.8	342.687	131.55	140.21	262
470.000	.03966	25.869	.003255	38.574	58377.5	62257.8	345.728	133.96	142.60	265
480.000	.03783	26.433	.003183	39.437	59730.7	63695.6	348.755	136.34	144.96	268
490.000	.03704	26.997	.003115	40.298	61107.3	65156.8	351.768	138.68	147.28	271
500.000	.03628	27.560	.003050	41.157	62507.1	66641.1	354.767	140.99	149.57	274
520.000	.03486	28.684	.002927	42.869	65374.9	69677.5	360.721	145.50	154.05	279
540.000	.03355	29.807	.002814	44.576	68331.1	72802.2	366.616	149.87	158.39	284
560.000	.03233	30.928	.002710	46.278	71373.0	76012.3	372.453	154.10	162.60	289
580.000	.03120	32.048	.002614	47.976	74498.0	79305.2	378.231	158.19	166.67	294
600.000	.03015	33.167	.002525	49.670	77703.2	82678.2	383.948	162.15	170.62	299
620.000	.02917	34.285	.002441	51.362	80986.2	86128.9	389.605	165.98	174.43	304
640.000	.02825	35.402	.002363	53.050	84344.4	89654.6	395.201	169.68	178.13	309
660.000	.02738	36.518	.002290	54.737	87775.4	93253.1	400.738	173.27	181.70	314
680.000	.02657	37.633	.002221	56.421	91276.9	96921.9	406.214	176.74	185.16	318
700.000	.02581	38.748	.002157	58.103	94846.6	100658.9	411.630	180.10	188.52	323

Table 22. Continued

I-BUTANE ISOBAR AT P =   2 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.637	12.755	.07840	22.3194	1359.741	6.3	22.0	108.314	73.23	98.82	1776
120.000	12.651	.07905	21.1239	1286.119	638.5	654.3	113.725	73.81	99.83	1729
130.000	12.486	.08009	19.4228	1180.858	1645.0	1661.8	121.781	74.85	101.48	1659
140.000	12.322	.08116	17.9061	1086.347	2667.9	2684.2	129.365	76.01	103.23	1593
150.000	12.157	.08226	16.5444	1000.780	3708.4	3724.9	136.549	77.29	105.05	1529
160.000	11.991	.08340	15.3144	922.739	4767.4	4784.1	143.389	78.68	106.96	1469
170.000	11.825	.08457	14.1973	851.100	5845.9	5862.8	149.933	80.16	108.96	1410
180.000	11.657	.08578	13.1778	784.942	6944.8	6962.0	156.219	81.73	111.03	1354
190.000	11.489	.08704	12.2433	723.536	8065.2	8082.6	162.280	83.37	113.19	1300
200.000	11.319	.08835	11.3831	666.265	9208.0	9225.6	168.142	85.07	115.43	1247
210.000	11.147	.08971	10.5884	612.673	10374.2	10392.2	173.830	86.83	117.76	1195
220.000	10.973	.09113	9.8515	562.184	11565.0	11583.2	179.364	88.64	120.18	1145
230.000	10.796	.09263	9.1656	514.594	12781.2	12799.8	184.762	90.49	122.70	1095
240.000	10.616	.09419	8.5252	469.557	14024.1	14043.0	190.039	92.37	125.33	1046
250.000	10.433	.09585	7.9249	426.824	15294.9	15314.0	195.210	94.27	128.07	998
260.000	10.245	.09761	7.3604	386.190	16594.6	16614.2	200.289	96.20	130.95	951
270.000	10.051	.09949	6.8275	347.479	17925.0	17944.9	205.287	98.14	133.99	903
279.971	9.852	.10150	6.3239	310.656	19293.0	19313.3	210.213	100.09	137.22	856
279.971	.09132	10.950	.008184	20.463	37407.2	39597.2	282.663	84.65	95.64	199
280.000	.09131	10.952	.008183	20.467	37409.7	39600.0	282.673	84.66	95.65	199
290.000	.08751	11.427	.007778	21.547	38281.7	40567.1	286.067	87.19	97.82	203
300.000	.08407	11.895	.007421	22.595	39177.7	41556.6	289.421	89.78	100.13	208
310.000	.08093	12.357	.007103	23.618	40098.5	42569.8	292.744	92.43	102.54	212
320.000	.07804	12.813	.006817	24.620	41044.7	43607.4	296.038	95.10	105.01	216
330.000	.07538	13.266	.006556	25.604	42016.8	44670.0	299.308	97.78	107.53	220
340.000	.07291	13.715	.006318	26.573	43015.0	45758.0	302.556	100.48	110.08	223
350.000	.07062	14.161	.006099	27.529	44039.5	46871.6	305.784	103.17	112.65	227
360.000	.06848	14.603	.005896	28.473	45090.3	48011.0	308.994	105.86	115.24	230
370.000	.06647	15.044	.005709	29.407	46167.4	49176.2	312.186	108.54	117.82	234
380.000	.06459	15.482	.005534	30.332	47270.8	50367.2	315.363	111.20	120.40	237
390.000	.06282	15.919	.005371	31.250	48400.3	51584.1	318.523	113.85	122.97	240
400.000	.06115	16.353	.005218	32.160	49555.9	52826.5	321.669	116.47	125.53	244
410.000	.05957	16.786	.005075	33.065	50737.2	54094.5	324.800	119.07	128.07	247
420.000	.05808	17.218	.004940	33.963	51944.0	55387.7	327.916	121.64	130.58	250
430.000	.05666	17.649	.004812	34.857	53176.2	56706.0	331.018	124.18	133.08	253
440.000	.05531	18.078	.004692	35.746	54433.4	58049.1	334.106	126.69	135.54	256
450.000	.05403	18.507	.004578	36.631	55715.3	59416.7	337.179	129.17	137.98	259
460.000	.05281	18.935	.004470	37.512	57021.7	60808.6	340.239	131.61	140.39	262
470.000	.05165	19.361	.004367	38.390	58352.1	62224.4	343.284	134.02	142.77	265
480.000	.05054	19.787	.004269	39.265	59706.3	63663.8	346.314	136.39	145.12	268
490.000	.04947	20.213	.004176	40.136	61084.2	65126.7	349.330	138.73	147.43	270
500.000	.04846	20.638	.004087	41.006	62484.9	66612.4	352.332	141.04	149.71	273
520.000	.04654	21.485	.003920	42.738	65354.3	69651.4	358.291	145.54	154.17	279
540.000	.04478	22.331	.003768	44.462	68312.0	72778.3	364.191	149.90	158.50	284
560.000	.04315	23.176	.003627	46.179	71355.2	75990.4	370.031	154.13	162.69	289
580.000	.04163	24.019	.003497	47.891	74481.3	79285.1	375.812	158.21	166.76	294
600.000	.04022	24.861	.003376	49.597	77687.6	82659.7	381.532	162.17	170.69	299
620.000	.03891	25.702	.003263	51.300	80971.4	86111.7	387.191	166.00	174.50	304
640.000	.03768	26.542	.003158	52.999	84330.4	89638.7	392.790	169.70	178.19	309
660.000	.03652	27.381	.003060	54.694	87762.1	93238.3	398.328	173.29	181.76	314
680.000	.03544	28.219	.002968	56.387	91264.3	96908.1	403.805	176.76	185.21	318
700.000	.03441	29.057	.002881	58.077	94834.6	100646.0	409.223	180.12	188.56	323

110

Table 22.   Continued

I-BUTANE ISOBAR AT P =   3 BAR

T	DEN	VOL	DP/DT	DP/CD	E	H	S	CV	CP	W
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
113.680	12.755	.07840	22.3197	1360.295	9.4	32.9	108.342	73.24	98.83	1777
120.000	12.651	.07904	21.1324	1287.167	637.3	661.0	113.715	73.81	99.83	1730
130.000	12.487	.08008	19.4310	1181.872	1643.6	1667.6	121.770	74.85	101.48	1660
140.000	12.322	.08115	17.9141	1087.335	2666.4	2690.8	129.354	76.01	103.22	1593
150.000	12.158	.08225	16.5523	1001.746	3706.8	3731.4	136.537	77.29	105.05	1530
160.000	11.992	.08339	15.3221	923.688	4765.6	4790.6	143.378	78.68	106.96	1469
170.000	11.826	.08456	14.2048	852.034	5843.8	5869.2	149.921	80.16	108.95	1411
180.000	11.658	.08577	13.1852	785.866	6942.0	6968.3	156.207	81.73	111.02	1355
190.000	11.490	.08703	12.2506	724.452	8062.7	8088.8	162.267	83.37	113.18	1300
200.000	11.320	.08834	11.3904	667.176	9205.3	9231.8	168.129	85.07	115.42	1247
210.000	11.148	.08970	10.5956	613.531	10371.3	10398.2	173.816	86.83	117.75	1196
220.000	10.975	.09112	9.8587	563.092	11561.8	11589.1	179.350	88.64	120.17	1146
230.000	10.798	.09261	9.1729	515.504	12777.7	12805.5	184.746	90.49	122.68	1096
240.000	10.619	.09417	8.5324	470.471	14020.1	14048.5	190.023	92.37	125.30	1047
250.000	10.435	.09583	7.9323	427.745	15290.6	15319.3	195.193	94.27	128.04	999
260.000	10.247	.09759	7.3679	387.119	16589.9	16619.2	200.270	96.20	130.92	952
270.000	10.054	.09946	6.8351	348.422	17919.7	17949.5	205.268	98.14	133.96	904
280.000	9.855	.10147	6.3302	311.504	19281.6	19312.1	210.197	100.10	137.18	857
290.000	9.647	.10366	5.8498	276.254	20677.6	20708.7	215.071	102.05	140.65	809
292.603	9.592	.10425	5.7283	267.339	21055.3	21086.6	216.335	102.56	141.60	796
292.603	.13405	7.460	.012326	20.308	38355.2	40593.2	283.001	88.54	100.72	199
300.000	.12974	7.707	.011830	21.188	39031.1	41343.3	285.533	90.37	102.14	202
310.000	.12445	8.036	.011241	22.335	39964.3	42375.0	288.916	92.92	104.25	207
320.000	.11965	8.358	.010723	23.445	40921.1	43428.4	292.261	95.53	106.49	212
330.000	.11527	8.675	.010261	24.523	41902.4	44504.8	295.573	98.17	108.83	216
340.000	.11126	8.988	.009846	25.575	42908.7	45605.0	298.858	100.82	111.23	220·
350.000	.10756	9.297	.009470	26.605	43940.3	46729.5	302.117	103.48	113.68	224
360.000	.10413	9.603	.009126	27.616	44997.6	47878.6	305.355	106.15	116.16	228
370.000	.10094	9.907	.008811	28.610	46080.5	49052.5	308.571	108.80	118.65	231
380.000	.09796	10.208	.008520	29.590	47189.4	50251.7	311.769	111.44	121.16	235
390.000	.09517	10.507	.008251	30.557	48323.7	51475.8	314.948	114.07	123.66	238
400.000	.09256	10.804	.008001	31.513	49483.5	52724.8	318.111	116.67	126.16	242
410.000	.09009	11.100	.007768	32.459	50668.2	53998.7	321.256	119.25	128.64	245
420.000	.08777	11.394	.007549	33.396	51879.3	55297.5	324.386	121.81	131.11	248
430.000	.08557	11.687	.007344	34.325	53114.8	56620.8	327.500	124.34	133.57	251
440.000	.08348	11.978	.007152	35.248	54375.0	57968.6	330.598	126.83	135.99	254
450.000	.08151	12.269	.006970	36.163	55659.8	59340.5	333.682	129.30	138.40	258
460.000	.07963	12.559	.006798	37.073	56968.8	60736.4	336.750	131.73	140.78	261
470.000	.07784	12.847	.006636	37.977	58301.6	62155.9	339.802	134.13	143.13	264
480.000	.07613	13.136	.006481	38.877	59658.1	63598.7	342.840	136.50	145.45	266
490.000	.07450	13.423	.006335	39.772	61037.8	65064.7	345.863	138.83	147.74	269
500.000	.07294	13.709	.006195	40.663	62440.5	66553.4	348.870	141.13	150.00	272
520.000	.07002	14.281	.005935	42.435	65313.4	69597.8	354.840	145.62	154.43	278
540.000	.06734	14.851	.005698	44.195	68274.2	72729.4	360.749	149.97	158.72	283
560.000	.06486	15.419	.005480	45.944	71320.0	75945.6	366.597	154.19	162.89	288
580.000	.06256	15.985	.005280	47.684	74448.4	79244.0	372.384	158.27	166.93	294
600.000	.06042	16.550	.005094	49.417	77656.8	82621.8	378.110	162.22	170.84	299
620.000	.05843	17.114	.004921	51.142	80942.5	86076.8	383.774	166.04	174.64	304
640.000	.05657	17.678	.004761	52.862	84303.1	89606.4	389.377	169.74	178.31	309
660.000	.05482	18.240	.004610	54.578	87736.3	93208.3	394.918	173.32	181.87	313
680.000	.05319	18.802	.004470	56.288	91239.7	96880.3	400.399	176.78	185.32	318
700.000	.05164	19.363	.004338	57.995	94811.2	100620.1	405.819	180.14	188.65	323

Table 22. Continued

I-BUTANE ISCBAR AT P =   4 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.723	12.755	.07840	22.3200	1360.849	12.5	43.9	108.369	73.24	98.83	1777
120.000	12.652	.07904	21.1410	1288.214	636.1	667.7	113.705	73.81	99.82	1731
130.000	12.488	.08008	19.4393	1182.886	1642.2	1674.3	121.760	74.85	101.48	1661
140.000	12.323	.08115	17.9221	1088.322	2664.9	2697.4	129.343	76.01	103.22	1594
150.000	12.159	.08225	16.5601	1002.711	3705.1	3738.0	136.526	77.29	105.04	1531
160.000	11.993	.08338	15.3297	924.636	4763.7	4797.1	143.366	78.68	106.95	1470
170.000	11.827	.08455	14.2123	852.968	5841.8	5875.6	149.909	80.16	108.94	1412
180.000	11.660	.08577	13.1926	786.789	6940.4	6974.7	156.195	81.73	111.02	1355
190.000	11.491	.08702	12.2579	725.368	8060.3	8095.1	162.254	83.37	113.17	1301
200.000	11.322	.08833	11.3976	668.087	9202.6	9238.0	168.116	85.07	115.41	1248
210.000	11.150	.08969	10.6028	614.439	10368.4	10404.3	173.803	86.83	117.74	1197
220.000	10.976	.09110	9.8659	564.000	11558.6	11595.0	179.335	88.64	120.15	1146
230.000	10.800	.09259	9.1801	516.414	12774.2	12811.3	184.731	90.49	122.66	1097
240.000	10.621	.09416	8.5397	471.385	14016.4	14054.1	190.007	92.37	125.28	1048
250.000	10.438	.09581	7.9396	428.665	15286.4	15324.7	195.176	94.27	128.02	1000
260.000	10.250	.09756	7.3757	388.047	16585.2	16624.3	200.252	96.20	130.89	953
270.000	10.057	.09943	6.8427	349.360	17914.5	17954.3	205.248	98.14	133.92	905
280.000	9.858	.10144	6.3380	312.456	19275.8	19316.4	210.176	100.10	137.14	858
290.000	9.651	.10362	5.8578	277.221	20671.1	20712.5	215.048	102.05	140.59	810
300.000	9.435	.10599	5.3987	243.549	22102.8	22145.2	219.877	104.02	144.35	762
302.383	9.381	.10659	5.2920	235.743	22455.2	22497.8	221.020	104.48	145.30	751
302.383	.17669	5.659	.016626	19.972	39094.9	41358.7	283.394	91.65	105.05	198
310.000	.17064	5.860	.015888	20.954	39819.4	42163.4	286.023	93.49	106.32	202
320.000	.16348	6.117	.015047	22.187	40789.0	43235.8	289.428	96.01	108.23	207
330.000	.15703	6.368	.014317	23.371	41781.1	44328.3	292.790	98.59	110.32	212
340.000	.15119	6.614	.013671	24.514	42796.7	45442.4	296.116	101.19	112.53	216
350.000	.14585	6.856	.013095	25.625	43836.8	46579.3	299.411	103.82	114.83	220
360.000	.14095	7.095	.012576	26.707	44901.2	47739.1	302.679	106.44	117.18	224
370.000	.13642	7.330	.012105	27.765	45990.5	48922.7	305.922	109.07	119.56	228
380.000	.13221	7.564	.011675	28.803	47104.8	50130.3	309.142	111.69	121.98	232
390.000	.12830	7.794	.011280	29.822	48244.3	51362.0	312.342	114.29	124.40	236
400.000	.12464	8.023	.010915	30.825	49408.8	52618.1	315.522	116.88	126.83	239
410.000	.12121	8.250	.010577	31.815	50598.3	53898.5	318.684	119.44	129.26	243
420.000	.11799	8.476	.010263	32.792	51812.7	55203.1	321.828	121.98	131.68	246
430.000	.11494	8.700	.009970	33.757	53051.8	56531.5	324.954	124.50	134.08	250
440.000	.11207	8.923	.009696	34.713	54315.3	57884.5	328.064	126.98	136.47	253
450.000	.10935	9.145	.009438	35.660	55603.0	59261.0	331.157	129.44	138.84	256
460.000	.10677	9.366	.009196	36.599	56914.7	60661.0	334.235	131.86	141.18	259
470.000	.10432	9.586	.008967	37.531	58250.1	62084.4	337.296	134.25	143.50	262
480.000	.10199	9.805	.008751	38.456	59608.9	63530.9	340.341	136.61	145.80	265
490.000	.09977	10.023	.008546	39.375	60991.1	65000.0	343.371	138.93	148.06	268
500.000	.09765	10.241	.008352	40.288	62395.8	66492.2	346.385	141.22	150.30	271
520.000	.09368	10.675	.007991	42.101	65272.4	69542.2	352.366	145.70	154.69	277
540.000	.09004	11.106	.007663	43.896	68236.3	72678.7	358.284	150.04	158.95	282
560.000	.08668	11.536	.007363	45.678	71284.9	75899.3	364.140	154.25	163.09	288
580.000	.08358	11.964	.007088	47.447	74415.7	79201.5	369.933	158.32	167.11	293
600.000	.08070	12.391	.006834	49.206	77626.2	82582.8	375.665	162.26	171.01	298
620.000	.07802	12.817	.006599	50.955	80913.8	86040.6	381.334	166.08	174.78	303
640.000	.07551	13.243	.006380	52.697	84276.1	89573.1	386.941	169.77	178.44	308
660.000	.07317	13.667	.006176	54.432	87710.7	93177.4	392.486	173.35	181.99	313
680.000	.07097	14.090	.005985	56.161	91215.5	96851.6	397.971	176.81	185.42	318
700.000	.06890	14.513	.005807	57.885	94788.2	100593.4	403.394	180.16	188.75	323

112

Table 22. Continued

I-BUTANE ISOBAR AT P =   5 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.766	12.755	.07840	22.3204	1361.405	15.6	54.8	108.396	73.24	98.83	1777
120.000	12.653	.07903	21.1495	1289.262	634.8	674.4	113.695	73.81	99.82	1731
130.000	12.489	.08007	19.4475	1183.9[1	1640.9	1680.9	121.749	74.85	101.47	1661
140.000	12.324	.08114	17.9301	1089.309	2663.4	2704.0	129.332	76.01	103.21	1595
150.000	12.160	.08224	16.5679	1003.677	3703.4	3744.5	136.515	77.29	105.04	1531
160.000	11.994	.08337	15.3373	925.583	4761.9	4803.6	143.354	78.68	106.95	1471
170.000	11.828	.08454	14.2198	853.902	5839.8	5882.1	149.897	80.16	108.94	1412
180.000	11.661	.08576	13.2000	787.713	6938.1	6981.0	156.182	81.73	111.01	1356
190.000	11.493	.08701	12.2652	726.284	8057.9	8101.4	162.241	83.37	113.16	1302
200.000	11.323	.08831	11.4049	668.998	9200.0	9244.2	168.102	85.07	115.40	1249
210.000	11.152	.08967	10.6100	615.347	10365.5	10410.3	173.789	86.83	117.72	1198
220.000	10.978	.09109	9.8731	564.908	11555.4	11600.9	179.321	88.64	120.14	1147
230.000	10.802	.09258	9.1873	517.324	12770.7	12817.0	184.716	90.49	122.65	1098
240.000	10.623	.09414	8.5469	472.299	14012.6	14059.7	189.991	92.37	125.26	1049
250.000	10.440	.09579	7.9469	429.585	15282.1	15330.0	195.159	94.27	127.99	1001
260.000	10.253	.09754	7.3827	388.975	16580.5	16629.3	200.234	96.20	130.86	954
270.000	10.060	.09940	6.8502	350.298	17909.3	17959.0	205.229	98.14	133.88	906
280.000	9.861	.10141	6.3457	313.407	19270.0	19320.7	210.155	100.10	137.09	859
290.000	9.655	.10358	5.8658	278.187	20664.5	20716.3	215.026	102.05	140.54	811
300.000	9.439	.10595	5.4070	244.534	22095.3	22148.3	219.852	104.02	144.28	763
310.000	9.211	.10856	4.9661	212.351	23565.6	23619.8	224.649	105.98	148.41	715
310.493	9.200	.10870	4.9447	210.800	23641.1	23695.4	224.878	106.08	148.63	712
310.493	.21958	4.554	.021105	19.542	39709.9	41986.9	283.789	94.29	108.97	197
320.000	.20995	4.763	.019875	20.854	40647.1	43028.7	287.094	96.56	110.31	202
330.000	.20096	4.976	.018781	22.159	41652.0	44140.1	290.514	99.04	112.05	207
340.000	.19293	5.183	.017837	23.4[5	42678.7	45270.4	293.888	101.59	114.01	212
350.000	.18567	5.386	.017008	24.603	43727.7	46420.7	297.223	104.17	116.10	217
360.000	.17906	5.585	.016271	25.762	44800.2	47592.5	300.524	106.76	118.30	221
370.000	.17301	5.780	.015610	26.889	45896.5	48786.5	303.796	109.35	120.55	225
380.000	.16743	5.973	.015013	27.987	47017.2	50003.5	307.041	111.94	122.86	229
390.000	.16226	6.163	.014469	29.061	48162.2	51243.6	310.263	114.52	125.19	233
400.000	.15746	6.351	.013971	30.114	49331.7	52507.2	313.462	117.09	127.55	237
410.000	.15297	6.537	.013512	31.148	50525.8	53794.4	316.641	119.64	129.91	241
420.000	.14877	6.722	.013089	32.166	51744.6	55105.4	319.799	122.16	132.27	244
430.000	.14482	6.905	.012695	33.169	52987.3	56439.8	322.939	124.66	134.62	248
440.000	.14111	7.087	.012329	34.160	54254.3	57797.7	326.061	127.13	136.97	251
450.000	.13760	7.267	.011987	35.139	55545.2	59178.9	329.165	129.58	139.29	254
460.000	.13428	7.447	.011666	36.107	56859.8	60583.3	332.252	131.99	141.60	258
470.000	.13113	7.626	.011364	37.066	58197.8	62010.8	335.322	134.37	143.89	261
480.000	.12814	7.804	.011080	38.017	59559.1	63461.0	338.375	136.72	146.16	264
490.000	.12530	7.981	.010812	38.960	60943.3	64933.7	341.412	139.04	148.40	267
500.000	.12259	8.157	.010558	39.896	62350.1	66428.7	344.433	141.32	150.62	270
520.000	.11753	8.508	.010089	41.749	65230.4	69484.6	350.425	145.78	154.96	276
540.000	.11290	8.857	.009664	43.581	68197.6	72626.2	356.353	150.11	159.19	281
560.000	.10865	9.204	.009277	45.394	71249.1	75851.2	362.217	154.31	163.30	287
580.000	.10471	9.550	.008923	47.192	74382.4	79157.3	368.017	158.37	167.30	292
600.000	.10107	9.894	.008597	48.977	77595.1	82542.1	373.755	162.31	171.17	298
620.000	.09768	10.237	.008296	50.751	80884.8	86003.5	379.429	166.12	174.93	303
640.000	.09452	10.579	.008017	52.515	84248.9	89538.6	385.041	169.81	178.57	308
660.000	.09157	10.921	.007757	54.270	87685.1	93145.5	390.590	173.38	182.11	313
680.000	.08880	11.261	.007515	56.017	91191.3	96821.9	396.077	176.84	185.53	317
700.000	.08620	11.601	.007288	57.758	94765.2	100565.8	401.504	180.19	188.85	322

1 13

Table 22. Continued

I-BUTANE ISOBAR AT P =   6 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.809	12.755	.07840	22.3207	1361.961	18.7	65.8	108.424	73.25	98.84	1778
120.000	12.654	.07903	21.1580	1290.309	633.6	681.0	113.684	73.81	99.82	1732
130.000	12.490	.08007	19.4558	1184.915	1639.5	1687.5	121.739	74.85	101.47	1662
140.000	12.325	.08113	17.9381	1090.297	2661.9	2710.6	129.321	76.01	103.21	1595
150.000	12.160	.08223	16.5757	1004.642	3701.7	3751.1	136.504	77.29	105.03	1532
160.000	11.995	.08337	15.3450	926.531	4760.1	4810.1	143.343	78.68	106.94	1471
170.000	11.829	.08454	14.2273	854.836	5837.8	5888.5	149.885	80.16	108.93	1413
180.000	11.662	.08575	13.2073	788.636	6935.9	6987.4	156.170	81.73	111.00	1357
190.000	11.494	.08700	12.2725	727.199	8055.5	8107.7	162.229	83.37	113.15	1303
200.000	11.325	.08830	11.4121	669.908	9197.3	9250.3	168.089	85.07	115.39	1250
210.000	11.153	.08966	10.6172	616.255	10362.6	10416.4	173.775	86.83	117.71	1198
220.000	10.980	.09108	9.8802	565.815	11552.2	11606.9	179.306	88.64	120.12	1148
230.000	10.804	.09256	9.1945	518.233	12767.3	12822.8	184.701	90.49	122.63	1099
240.000	10.625	.09412	8.5542	473.212	14008.8	14065.2	189.975	92.37	125.24	1050
250.000	10.442	.09577	7.9542	430.503	15277.9	15335.3	195.142	94.27	127.97	1002
260.000	10.255	.09751	7.3901	389.902	16575.9	16634.4	200.216	96.20	130.83	955
270.000	10.063	.09938	6.8578	351.236	17904.1	17963.7	205.210	98.14	133.84	907
280.000	9.864	.10138	6.3535	314.357	19264.2	19325.0	210.135	100.10	137.05	860
290.000	9.658	.10354	5.8737	279.153	20658.0	20720.1	215.003	102.05	140.48	813
300.000	9.443	.10590	5.4153	245.517	22087.9	22151.5	219.827	104.02	144.20	765
310.000	9.216	.10850	4.9748	213.357	23557.1	23622.2	224.621	105.98	148.31	716
317.489	9.037	.11065	4.6546	190.183	24683.8	24750.2	228.191	107.45	151.73	679
317.489	.26292	3.803	.025777	19.056	40239.9	42522.0	284.167	96.63	112.64	195
320.000	.25959	3.852	.025323	19.437	40493.7	42805.0	285.055	97.19	112.86	197
330.000	.24743	4.042	.023731	20.885	41514.5	43939.5	288.546	99.56	114.09	202
340.000	.23674	4.224	.022394	22.247	42553.5	45088.0	291.975	102.02	115.70	208
350.000	.22721	4.401	.021245	23.543	43613.1	46253.8	295.355	104.54	117.54	213
360.000	.21863	4.574	.020239	24.787	44694.5	47438.9	298.694	107.09	119.53	218
370.000	.21084	4.743	.019348	25.987	45798.7	48644.5	301.997	109.65	121.64	222
380.000	.20370	4.909	.018550	27.150	46926.2	49871.6	305.270	112.21	123.82	227
390.000	.19714	5.072	.017831	28.281	48077.6	51121.0	308.515	114.76	126.05	231
400.000	.19107	5.234	.017178	29.385	49252.5	52392.7	311.734	117.31	128.31	235
410.000	.18543	5.393	.016581	30.466	50451.4	53687.1	314.931	119.84	130.60	239
420.000	.18017	5.550	.016032	31.526	51674.2	55004.4	318.105	122.34	132.89	242
430.000	.17525	5.706	.015526	32.568	52921.0	56344.7	321.259	124.83	135.19	246
440.000	.17063	5.861	.015056	33.594	54191.5	57708.0	324.394	127.29	137.48	249
450.000	.16628	6.014	.014620	34.606	55485.7	59094.1	327.509	129.72	139.77	253
460.000	.16217	6.166	.014212	35.604	56803.3	60503.1	330.606	132.12	142.04	256
470.000	.15829	6.318	.013831	36.591	58144.1	61934.8	333.685	134.49	144.30	259
480.000	.15460	6.468	.013472	37.568	59508.0	63388.8	336.746	136.83	146.53	263
490.000	.15111	6.618	.013135	38.535	60894.5	64865.2	339.790	139.14	148.75	266
500.000	.14778	6.767	.012817	39.493	62303.8	66363.8	342.817	141.41	150.94	269
520.000	.14159	7.063	.012230	41.387	65188.0	69425.6	348.822	145.87	155.24	275
540.000	.13593	7.356	.011702	43.255	68158.5	72572.4	354.759	150.18	159.44	281
560.000	.13075	7.648	.011223	45.101	71213.0	75802.0	360.632	154.37	163.52	286
580.000	.12596	7.939	.010786	46.929	74348.3	79112.2	366.439	158.43	167.49	292
600.000	.12154	8.228	.010384	48.740	77563.8	82500.5	372.183	162.35	171.34	297
620.000	.11743	8.516	.010015	50.537	80855.3	85964.8	377.862	166.16	175.08	302
640.000	.11360	8.803	.009673	52.323	84221.1	89502.8	383.478	169.84	178.71	307
660.000	.11002	9.089	.009355	54.097	87658.9	93112.3	389.032	173.41	182.23	312
680.000	.10668	9.374	.009059	55.863	91166.5	96791.0	394.523	176.86	185.64	317
700.000	.10353	9.659	.008782	57.621	94741.7	100537.1	399.952	180.21	188.95	322

Table 22. Continued

I-BUTANE ISOBAR AT P = 7 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.852	12.755	.07840	22.3211	1362.519	21.8	76.7	108.451	73.25	98.84	1778
120.000	12.654	.07902	21.1666	1291.356	632.4	687.7	113.674	73.81	99.81	1733
130.000	12.490	.08006	19.4640	1185.929	1638.1	1694.2	121.728	74.85	101.47	1663
140.000	12.326	.08113	17.9461	1091.284	2660.4	2717.2	129.311	76.01	103.20	1596
150.000	12.161	.08223	16.5835	1005.607	3700.1	3757.6	136.493	77.29	105.03	1533
160.000	11.996	.08336	15.3526	927.479	4758.2	4816.6	143.331	78.68	106.93	1472
170.000	11.830	.08453	14.2348	855.769	5835.8	5894.9	149.873	80.16	108.92	1414
180.000	11.664	.08574	13.2147	789.559	6933.7	6993.7	156.158	81.73	110.99	1358
190.000	11.496	.08699	12.2798	728.114	8053.0	8113.9	162.216	83.37	113.14	1303
200.000	11.326	.08829	11.4193	670.818	9194.7	9256.5	168.076	85.07	115.38	1251
210.000	11.155	.08965	10.6244	617.162	10359.7	10422.4	173.761	86.83	117.70	1199
220.000	10.982	.09106	9.8874	566.722	11549.0	11612.8	179.292	88.64	120.11	1149
230.000	10.806	.09254	9.2017	519.141	12763.8	12828.5	184.685	90.49	122.61	1100
240.000	10.627	.09410	8.5614	474.124	14004.9	14070.8	189.959	92.37	125.22	1051
250.000	10.445	.09574	7.9615	431.422	15273.1	15340.7	195.125	94.27	127.94	1003
260.000	10.258	.09749	7.3975	390.828	16571.2	16639.4	200.198	96.20	130.80	956
270.000	10.066	.09935	6.8653	352.172	17898.9	17968.4	205.190	98.14	133.81	908
280.000	9.867	.10134	6.3612	315.306	19258.4	19329.3	210.114	100.10	137.00	861
290.000	9.662	.10350	5.8817	280.117	20651.5	20723.9	214.980	102.05	140.42	814
300.000	9.447	.10586	5.4236	246.500	22080.5	22154.6	219.803	104.02	144.13	766
310.000	9.221	.10845	4.9835	214.362	23548.6	23624.5	224.594	105.98	148.22	718
320.000	8.981	.11135	4.5580	183.611	25059.8	25137.7	229.371	107.94	152.83	668
323.680	8.888	.11251	4.4044	172.623	25623.0	25701.8	231.117	108.66	154.70	650
323.680	.30685	3.259	.030655	18.532	40707.5	42988.8	284.525	98.74	116.17	193
330.000	.29691	3.368	.029267	19.540	41366.5	43724.1	286.774	100.14	116.55	197
340.000	.28295	3.534	.027410	21.038	42420.6	44894.5	290.269	102.49	117.66	203
350.000	.27070	3.694	.025851	22.444	43492.1	46078.2	293.700	104.94	119.16	209
360.000	.25981	3.849	.024511	23.781	44584.0	47278.2	297.081	107.44	120.91	214
370.000	.25002	4.000	.023341	25.060	45696.8	48496.6	300.420	109.96	122.82	219
380.000	.24113	4.147	.022306	26.292	46832.1	49735.1	303.722	112.48	124.85	224
390.000	.23301	4.292	.021381	27.485	47989.7	50993.9	306.992	115.01	126.96	228
400.000	.22554	4.434	.020547	28.643	49170.5	52274.1	310.234	117.53	129.12	232
410.000	.21863	4.574	.019791	29.773	50374.5	53576.2	313.449	120.04	131.32	236
420.000	.21222	4.712	.019101	30.877	51602.0	54900.4	316.640	122.53	133.55	240
430.000	.20624	4.849	.018467	31.959	52852.9	56247.0	319.809	125.00	135.78	244
440.000	.20065	4.984	.017882	33.021	54127.3	57615.9	322.956	127.44	138.03	248
450.000	.19540	5.118	.017341	34.066	55425.2	59007.6	326.083	129.86	140.26	251
460.000	.19046	5.250	.016838	35.095	56745.9	60421.3	329.191	132.25	142.50	255
470.000	.18580	5.382	.016368	36.110	58089.7	61857.2	332.279	134.61	144.71	258
480.000	.18138	5.513	.015929	37.113	59456.1	63315.3	335.349	136.94	146.92	261
490.000	.17720	5.643	.015517	38.104	60845.1	64795.3	339.401	139.24	149.10	264
500.000	.17323	5.773	.015129	39.085	62256.3	66297.1	341.435	141.51	151.27	268
520.000	.16586	6.029	.014417	41.021	65144.6	69365.0	347.451	145.95	155.53	274
540.000	.15914	6.284	.013778	42.925	68118.6	72517.2	353.399	150.25	159.68	260
560.000	.15299	6.536	.013201	44.803	71176.0	75751.4	359.280	154.43	163.74	285
580.000	.14733	6.787	.012676	46.659	74314.8	79066.0	365.094	158.48	167.68	291
600.000	.14211	7.037	.012196	48.497	77532.0	82458.0	370.844	162.40	171.51	296
620.000	.13726	7.286	.011754	50.318	80825.6	85925.5	376.529	166.20	175.23	302
640.000	.13275	7.533	.011347	52.125	84193.3	89466.4	382.150	169.88	178.85	307
660.000	.12854	7.780	.010969	53.919	87632.7	93078.4	387.707	173.44	182.35	312
680.000	.12460	8.026	.010617	55.703	91141.7	96759.6	393.202	176.89	185.75	317
700.000	.12091	8.271	.010289	57.478	94718.2	100507.9	398.634	180.24	189.05	322

Table 22. Continued

I-BUTANE ISOBAR AT P =   8 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.895	12.755	.07840	22.3215	1363.078	24.9	87.6	108.478	73.26	98.84	1778
120.000	12.655	.07902	21.1751	1292.404	631.2	694.4	113.664	73.81	99.81	1733
130.000	12.491	.08006	19.4722	1186.943	1636.8	1700.8	121.718	74.85	101.46	1663
140.000	12.327	.08112	17.9541	1092.271	2658.9	2723.8	129.300	76.01	103.20	1597
150.000	12.162	.08222	16.5913	1006.572	3698.4	3764.2	136.482	77.29	105.02	1533
160.000	11.997	.08335	15.3602	928.426	4756.4	4823.1	143.320	78.68	106.93	1473
170.000	11.832	.08452	14.2423	856.703	5833.8	5901.4	149.862	80.16	108.92	1415
180.000	11.665	.08573	13.2221	790.482	6931.5	7000.1	156.145	81.73	110.98	1358
190.000	11.497	.08698	12.2871	729.029	8050.6	8120.2	162.203	83.37	113.13	1304
200.000	11.328	.08828	11.4266	671.728	9192.1	9262.7	168.063	85.07	115.37	1251
210.000	11.157	.08963	10.6316	618.069	10356.8	10428.5	173.747	86.83	117.69	1200
220.000	10.983	.09105	9.8946	567.628	11545.9	11618.7	179.277	88.64	120.09	1150
230.000	10.808	.09253	9.2089	520.050	12760.3	12834.3	184.670	90.49	122.59	1101
240.000	10.629	.09408	8.5686	475.036	14001.1	14076.4	189.943	92.37	125.20	1052
250.000	10.447	.09572	7.9688	432.340	15269.5	15346.0	195.108	94.27	127.92	1004
260.000	10.260	.09746	7.4049	391.754	16566.5	16644.5	200.180	96.20	130.77	957
270.000	10.069	.09932	6.8729	353.108	17893.7	17973.2	205.171	98.14	133.77	909
280.000	9.871	.10131	6.3689	316.254	19252.6	19333.7	210.093	100.10	136.96	862
290.000	9.665	.10346	5.8897	281.080	20645.0	20727.8	214.958	102.05	140.37	815
300.000	9.451	.10581	5.4318	247.481	22073.2	22157.8	219.778	104.02	144.06	767
310.000	9.226	.10840	4.9922	215.364	23540.2	23626.9	224.567	105.98	148.13	719
320.000	8.986	.11128	4.5672	184.641	25050.0	25139.0	229.340	107.94	152.71	670
329.260	8.749	.11430	4.1835	157.346	26483.5	26575.0	233.751	109.76	157.60	623
329.260	.35149	2.845	.035752	17.982	41126.8	43402.8	284.859	100.67	119.61	191
330.000	.35003	2.857	.035536	18.111	41205.8	43491.3	285.128	100.82	119.60	192
340.000	.33196	3.012	.032970	19.770	42278.7	44688.6	288.702	103.02	119.99	199
350.000	.31642	3.160	.030884	21.303	43364.7	45893.0	292.194	105.38	121.03	205
360.000	.30280	3.302	.029128	22.742	44468.0	47110.0	295.623	107.81	122.46	210
370.000	.29070	3.440	.027618	24.108	45590.8	48342.9	299.000	110.28	124.13	216
380.000	.27981	3.574	.026300	25.415	46734.1	49593.1	302.335	112.77	125.98	221
390.000	.26994	3.705	.025133	26.672	47898.9	50862.5	305.633	115.27	127.94	225
400.000	.26092	3.833	.024091	27.888	49085.9	52152.0	308.898	117.76	129.99	230
410.000	.25262	3.958	.023153	29.069	50295.5	53462.2	312.133	120.25	132.10	234
420.000	.24496	4.082	.022302	30.218	51528.2	54794.1	315.342	122.72	134.24	238
430.000	.23784	4.205	.021525	31.341	52783.5	56147.1	318.526	125.17	136.41	242
440.000	.23120	4.325	.020812	32.441	54061.8	57522.0	321.687	127.60	138.59	246
450.000	.22499	4.445	.020155	33.520	55363.1	58918.7	324.826	130.01	140.78	249
460.000	.21916	4.563	.019546	34.580	56687.1	60337.3	327.944	132.38	142.97	253
470.000	.21368	4.680	.018980	35.625	58033.8	61777.8	331.042	134.74	145.15	256
480.000	.20850	4.796	.018453	36.654	59403.0	63240.0	334.121	137.06	147.31	260
490.000	.20360	4.912	.017959	37.670	60794.5	64723.8	337.180	139.35	149.47	263
500.000	.19895	5.026	.017496	38.674	62208.4	66229.4	340.222	141.61	151.61	266
520.000	.19035	5.254	.016650	40.651	65100.8	69303.6	346.250	146.03	155.82	273
540.000	.18253	5.479	.015894	42.592	68078.3	72461.2	352.208	150.33	159.94	279
560.000	.17539	5.702	.015213	44.503	71138.8	75700.2	358.098	154.49	163.96	285
580.000	.16883	5.923	.014595	46.388	74280.0	79018.6	363.920	158.53	167.88	290
600.000	.16278	6.143	.014032	48.251	77499.6	82414.3	369.676	162.45	171.69	296
620.000	.15718	6.362	.013516	50.095	80795.3	85885.1	375.366	166.24	175.39	301
640.000	.15197	6.580	.013040	51.924	84164.8	89429.0	380.992	169.91	178.99	306
660.000	.14712	6.797	.012600	53.738	87606.1	93044.0	386.553	173.47	182.48	311
680.000	.14258	7.014	.012191	55.540	91116.6	96727.5	392.051	176.92	185.87	316
700.000	.13833	7.229	.011810	57.331	94694.5	100477.8	397.487	180.26	189.16	321

Table 22. Continued

I-BUTANE ISOBAR AT P = 10 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
113.980	12.755	.07840	22.3224	1364.200	31.1	109.5	108.532	73.26	98.85	1779
120.000	12.657	.07901	21.1922	1294.498	628.7	707.7	113.644	73.81	99.80	1735
130.000	12.493	.08005	19.4887	1188.972	1634.0	1714.1	121.697	74.85	101.45	1665
140.000	12.329	.08111	17.9701	1094.245	2655.8	2737.0	129.278	76.01	103.19	1598
150.000	12.164	.08221	16.6068	1008.503	3695.1	3777.3	136.459	77.29	105.01	1535
160.000	12.000	.08334	15.3755	930.321	4752.7	4836.1	143.297	78.68	106.92	1474
170.000	11.834	.08450	14.2573	858.570	5829.7	5914.2	149.838	80.16	108.90	1416
180.000	11.667	.08571	13.2368	792.328	6927.1	7012.8	156.121	81.73	110.97	1360
190.000	11.500	.08696	12.3016	730.859	8045.8	8132.8	162.178	83.37	113.12	1306
200.000	11.331	.08826	11.4410	673.547	9186.8	9275.0	168.036	85.07	115.35	1253
210.000	11.160	.08961	10.6460	619.883	10351.0	10440.6	173.720	86.83	117.66	1202
220.000	10.987	.09102	9.9090	569.441	11539.6	11630.6	179.248	88.64	120.06	1151
230.000	10.812	.09249	9.2232	521.865	12753.4	12845.8	184.640	90.49	122.56	1102
240.000	10.633	.09404	8.5831	476.859	13993.5	14087.5	189.911	92.37	125.16	1054
250.000	10.451	.09568	7.9834	434.174	15261.1	15356.7	195.074	94.27	127.87	1006
260.000	10.265	.09742	7.4197	393.6(4	16557.3	16654.7	200.144	96.20	130.71	959
270.000	10.074	.09926	6.8879	354.978	17883.4	17982.7	205.133	98.14	133.70	912
280.000	9.877	.10125	6.3843	318.148	19241.1	19342.4	210.052	10(.10	136.87	865
290.000	9.672	.10339	5.9055	283.003	20632.1	20735.5	214.913	102.05	140.25	818
300.000	9.459	.10572	5.4483	249.439	22058.6	22164.3	219.729	104.02	143.92	770
310.000	9.235	.10829	5.0094	217.366	23523.5	23631.8	224.512	105.98	147.94	722
320.000	8.997	.11115	4.5855	186.695	25030.6	25141.7	229.279	107.94	152.46	673
330.000	8.742	.11439	4.1728	157.331	26585.3	26699.7	234.049	109.90	157.69	623
339.057	8.492	.11776	3.8048	131.763	28030.4	28148.1	238.382	111.68	163.34	575
339.057	.44334	2.256	.046655	16.825	41854.9	44110.5	285.461	104.15	126.47	187
340.000	.44075	2.269	.046249	17.012	41960.9	44229.7	285.812	104.32	126.33	188
350.000	.41603	2.404	.042538	18.867	43085.1	45488.8	289.462	106.38	125.77	195
360.000	.39521	2.530	.039595	20.555	44217.9	46748.1	293.010	108.63	126.21	202
370.000	.37723	2.651	.037163	22.123	45363.8	48014.7	296.481	110.99	127.22	208
380.000	.36144	2.767	.035101	23.598	46526.4	49293.2	299.891	113.39	128.57	214
390.000	.34736	2.879	.033318	24.999	47708.0	50586.8	303.251	115.81	130.16	219
400.000	.33469	2.988	.031756	26.340	48909.1	51896.9	306.568	118.25	131.92	224
410.000	.32318	3.094	.030372	27.630	50130.9	53225.2	309.848	12(.68	133.79	229
420.000	.31265	3.198	.029133	28.877	51374.2	54572.6	313.096	123.11	135.74	234
430.000	.30296	3.301	.028015	30.087	52639.1	55939.9	316.313	125.53	137.75	238
440.000	.29399	3.401	.027001	31.266	53926.3	57327.8	319.503	127.93	139.80	242
450.000	.28566	3.501	.026074	32.416	55235.3	58735.9	322.668	130.30	141.87	246
460.000	.27788	3.599	.025223	33.541	56566.3	60164.9	325.809	132.66	143.96	250
470.000	.27060	3.695	.024438	34.645	57919.4	61614.8	328.927	134.99	146.05	253
480.000	.26376	3.791	.023711	35.729	59294.4	63085.7	332.024	137.29	148.14	257
490.000	.25732	3.886	.023034	36.796	60691.2	64577.4	335.100	139.56	150.23	261
500.000	.25123	3.980	.022403	37.847	62109.6	66090.0	338.156	141.80	152.31	264
520.000	.24000	4.167	.021258	39.908	65010.9	69177.6	344.210	146.20	156.42	271
540.000	.22986	4.351	.020244	41.923	67995.8	72346.3	350.190	150.47	160.46	277
560.000	.22064	4.532	.019338	43.898	71062.7	75595.1	356.097	154.62	164.42	283
580.000	.21220	4.713	.018522	45.841	74209.5	78922.1	361.934	158.64	168.28	289
600.000	.20444	4.891	.017781	47.757	77433.9	82325.3	367.703	162.54	172.04	294
620.000	.19728	5.069	.017105	49.648	80734.2	85803.1	373.404	166.32	175.71	300
640.000	.19064	5.246	.016485	51.519	84107.6	89352.9	379.039	169.98	179.27	305
660.000	.18446	5.421	.015913	53.372	87551.9	92973.0	384.609	173.53	182.73	310
680.000	.17870	5.596	.015383	55.210	91065.4	96661.4	390.114	176.97	186.10	316
700.000	.17330	5.770	.014891	57.034	94645.9	100416.1	395.556	180.31	189.37	321

Table 22. Continued

I-BUTANE ISOBAR AT P = 12 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.065	12.755	.07840	22.3233	1365.326	37.2	131.3	108.585	73.27	98.86	1780
120.000	12.658	.07900	21.2092	1296.593	626.3	721.1	113.623	73.81	99.80	1736
130.000	12.495	.08003	19.5052	1191.000	1631.3	1727.4	121.676	74.85	101.45	1666
140.000	12.331	.08110	17.9861	1096.219	2652.8	2750.2	129.257	76.01	103.18	1600
150.000	12.166	.08219	16.6224	1010.433	3691.8	3790.4	136.437	77.29	105.00	1536
160.000	12.002	.08332	15.3907	932.216	4749.1	4849.1	143.274	78.68	106.90	1476
170.000	11.836	.08449	14.2722	860.436	5825.7	5927.1	149.814	80.16	108.89	1418
180.000	11.670	.08569	13.2516	794.172	6922.7	7025.5	156.096	81.73	110.95	1361
190.000	11.502	.08694	12.3162	732.688	8041.0	8145.3	162.152	83.37	113.10	1307
200.000	11.334	.08823	11.4554	675.365	9181.5	9287.4	168.010	85.07	115.33	1255
210.000	11.163	.08958	10.6604	621.695	10345.3	10452.8	173.692	86.83	117.64	1203
220.000	10.990	.09099	9.9233	571.251	11533.2	11642.4	179.219	88.64	120.03	1153
230.000	10.815	.09246	9.2376	523.679	12746.4	12857.4	184.610	90.49	122.53	1104
240.000	10.638	.09401	8.5975	478.680	13985.9	14098.7	189.879	92.37	125.12	1056
250.000	10.456	.09564	7.9979	436.006	15252.7	15367.5	195.041	94.27	127.82	1008
260.000	10.270	.09737	7.4344	395.451	16548.0	16664.9	200.109	96.20	130.65	961
270.000	10.080	.09921	6.9029	356.844	17873.2	17992.2	205.095	98.14	133.63	914
280.000	9.883	.10118	6.3996	320.039	19229.7	19351.1	210.011	100.10	136.78	867
290.000	9.679	.10331	5.9213	284.923	20619.3	20743.2	214.869	102.05	140.14	820
300.000	9.467	.10563	5.4647	251.393	22044.1	22170.8	219.680	104.02	143.78	773
310.000	9.244	.10818	5.0265	219.361	23506.9	23636.7	224.459	105.98	147.77	725
320.000	9.008	.11102	4.6036	188.741	25011.4	25144.6	229.219	107.94	152.23	676
330.000	8.755	.11422	4.1923	159.442	26562.8	26699.8	233.980	109.90	157.36	626
340.000	8.480	.11793	3.7880	131.350	28168.6	28310.1	238.766	111.87	163.52	574
347.524	8.253	.12116	3.4847	110.911	29407.6	29553.0	242.400	113.36	169.22	533
347.524	.53929	1.854	.058611	15.620	42470.4	44695.5	285.973	107.26	133.54	182
350.000	.53026	1.886	.057132	16.165	42762.2	45025.2	286.918	107.67	132.80	185
360.000	.49849	2.006	.052186	18.191	43936.8	46344.1	290.634	109.61	131.30	193
370.000	.47219	2.118	.048335	20.013	45114.0	47655.3	294.227	111.78	131.16	200
380.000	.44978	2.223	.045194	21.690	46301.4	48969.4	297.732	114.06	131.75	207
390.000	.43026	2.324	.042557	23.258	47502.6	50291.6	301.167	116.40	132.80	213
400.000	.41301	2.421	.040297	24.740	48720.5	51626.0	304.546	118.76	134.16	219
410.000	.39756	2.515	.038330	26.152	49956.9	52975.3	307.877	121.14	135.72	224
420.000	.38360	2.607	.036597	27.506	51212.5	54340.7	311.168	123.53	137.42	229
430.000	.37088	2.696	.035053	28.810	52488.2	55723.8	314.423	125.90	139.23	234
440.000	.35921	2.784	.033667	30.072	53784.6	57125.3	317.645	128.26	141.12	238
450.000	.34845	2.870	.032413	31.297	55102.4	58546.2	320.838	130.61	143.05	242
460.000	.33846	2.955	.031271	32.491	56441.0	59986.4	324.003	132.94	145.02	246
470.000	.32917	3.038	.030226	33.657	57800.9	61446.5	327.144	135.24	147.02	250
480.000	.32048	3.120	.029264	34.798	59182.0	62926.6	330.260	137.52	149.02	254
490.000	.31233	3.202	.028375	35.917	60584.6	64426.7	333.353	139.78	151.04	258
500.000	.30466	3.282	.027551	37.017	62008.2	65947.0	336.425	142.00	153.05	261
520.000	.29059	3.441	.026065	39.164	64918.6	69048.2	342.506	146.37	157.05	268
540.000	.27795	3.598	.024761	41.253	67911.3	72228.6	348.507	150.62	161.00	275
560.000	.26651	3.752	.023604	43.295	70984.8	75487.5	354.433	154.74	164.89	281
580.000	.25609	3.905	.022568	45.296	74137.3	78823.2	360.286	158.75	168.69	287
600.000	.24654	4.056	.021633	47.263	77367.1	82234.5	366.067	162.63	172.41	293
620.000	.23775	4.206	.020784	49.201	80671.5	85718.9	371.780	166.40	176.03	299
640.000	.22961	4.355	.020008	51.115	84048.6	89274.8	377.425	170.05	179.56	304
660.000	.22206	4.503	.019296	53.007	87496.5	92900.4	383.003	173.59	182.99	310
680.000	.21503	4.650	.018638	54.880	91013.1	96593.7	388.516	177.03	186.33	315
700.000	.20846	4.797	.018028	56.736	94596.5	100352.9	393.964	180.35	189.58	320

118

Table 22. Continued

I-BUTANE ISOBAR AT P = 14 BAR

T	DEN	VOL	DP/DT	DP/CD	E	H	S	CV	CP	W
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
114.150	12.755	.07840	22.3241	1366.434	43.3	153.1	108.639	73.28	98.87	1780
120.000	12.660	.07899	21.2262	1298.688	623.8	734.4	113.603	73.81	99.79	1737
130.000	12.496	.08002	19.5216	1193.028	1628.6	1740.7	121.655	74.85	101.44	1667
140.000	12.333	.08109	18.0020	1098.193	2649.8	2763.4	129.235	76.01	103.17	1601
150.000	12.168	.08218	16.6379	1012.362	3688.4	3803.5	136.415	77.29	104.99	1538
160.000	12.004	.08331	15.4059	934.110	4745.4	4862.1	143.251	78.68	106.89	1477
170.000	11.839	.08447	14.2871	862.302	5821.7	5940.0	149.791	80.16	108.88	1419
180.000	11.672	.08567	13.2663	796.016	6918.3	7038.3	156.072	81.73	110.94	1363
190.000	11.505	.08692	12.3307	734.516	8036.2	8157.9	162.127	83.37	113.08	1309
200.000	11.337	.08821	11.4699	677.182	9176.3	9299.8	167.983	85.07	115.30	1256
210.000	11.166	.08956	10.6747	623.506	10339.5	10464.9	173.665	86.83	117.61	1205
220.000	10.994	.09096	9.9376	573.061	11527.0	11654.3	179.191	88.64	120.01	1155
230.000	10.819	.09243	9.2519	525.491	12739.6	12869.0	184.580	90.49	122.49	1106
240.000	10.642	.09397	8.6118	480.499	13978.3	14109.9	189.847	92.37	125.08	1058
250.000	10.461	.09560	8.0124	437.836	15244.4	15378.2	195.007	94.27	127.77	1010
260.000	10.275	.09732	7.4491	397.296	16538.9	16675.1	200.073	96.20	130.59	963
270.000	10.085	.09915	6.9178	358.708	17863.0	18001.8	205.057	98.14	133.56	916
280.000	9.889	.10112	6.4149	321.926	19218.3	19359.9	209.970	100.10	136.69	869
290.000	9.686	.10324	5.9371	286.838	20606.5	20751.1	214.824	102.05	140.04	822
300.000	9.475	.10554	5.4810	253.342	22029.7	22177.4	219.632	104.02	143.64	775
310.000	9.253	.10807	5.0436	221.350	23490.5	23641.8	224.405	105.98	147.59	728
320.000	9.018	.11089	4.6217	190.780	24992.4	25147.7	229.159	107.94	151.99	679
330.000	8.767	.11406	4.2116	161.543	26540.5	26700.1	233.912	109.90	157.04	630
340.000	8.495	.11772	3.8091	133.534	28141.8	28306.6	238.686	111.87	163.07	578
350.000	8.193	.12205	3.4082	106.600	29807.9	29978.7	243.518	113.85	170.67	524
355.019	8.027	.12458	3.2047	93.412	30662.9	30837.3	245.983	114.86	175.43	495
355.019	.64016	1.562	.071769	14.383	42999.0	45186.0	286.399	110.10	141.12	178
360.000	.61698	1.621	.067843	15.586	43613.2	45882.3	288.348	110.85	138.77	183
370.000	.57817	1.730	.061672	17.747	44834.9	47256.3	292.113	112.72	136.44	192
380.000	.54651	1.830	.056920	19.676	46054.7	48616.4	295.740	114.82	135.77	200
390.000	.51977	1.924	.053078	21.442	47280.9	49974.4	299.268	117.04	136.01	207
400.000	.49666	2.013	.049874	23.086	48519.3	51338.1	302.721	119.32	136.79	213
410.000	.47634	2.099	.047144	24.634	49772.2	52711.3	306.112	121.63	137.94	219
420.000	.45823	2.182	.044779	26.1(4	51041.9	54097.2	309.452	123.96	139.32	224
430.000	.44191	2.263	.042702	27.510	52330.2	55498.5	312.748	126.29	140.88	229
440.000	.42709	2.341	.040860	28.862	53637.2	56915.2	316.006	128.61	142.57	234
450.000	.41353	2.418	.039210	30.167	54964.0	58349.5	319.230	130.93	144.34	239
460.000	.40104	2.493	.037721	31.433	56310.9	59801.8	322.422	133.23	146.17	243
470.000	.38949	2.567	.036369	32.663	57678.6	61273.1	325.586	135.50	148.05	247
480.000	.37874	2.640	.035133	33.863	59066.5	62763.0	328.723	137.76	149.96	251
490.000	.36871	2.712	.033998	35.036	60475.0	64272.0	331.835	140.00	151.89	255
500.000	.35931	2.783	.032951	36.185	61904.1	65800.5	334.923	142.20	153.83	259
520.000	.34215	2.923	.031080	38.421	64824.1	68915.9	341.032	146.54	157.71	266
540.000	.32683	3.060	.029450	40.586	67824.8	72108.4	347.056	150.76	161.57	273
560.000	.31303	3.195	.028015	42.694	70905.3	75377.7	353.001	154.87	165.37	280
580.000	.30051	3.328	.026738	44.754	74063.8	78722.5	358.869	158.86	169.12	286
600.000	.28908	3.459	.025592	46.774	77298.8	82141.8	364.665	162.73	172.78	292
620.000	.27858	3.590	.024556	48.759	80607.6	85633.0	370.389	166.48	176.36	298
640.000	.26890	3.719	.023612	50.715	83989.8	89195.3	376.043	170.12	179.86	303
660.000	.25992	3.847	.022749	52.645	87440.3	92826.4	381.630	173.66	183.26	309
680.000	.25158	3.975	.021955	54.553	90960.0	96524.8	337.150	177.08	186.57	314
700.000	.24381	4.102	.021221	56.442	94546.5	100288.8	392.605	180.40	189.80	319

Table 22. Continued

I-BUTANE ISOBAR AT P = 16 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.234	12.756	.07840	22.3250	1367.562	49.4	174.8	108.692	73.28	98.87	1781
120.000	12.661	.07898	21.2432	1300.783	621.4	747.8	113.582	73.81	99.78	1739
130.000	12.498	.08001	19.5380	1195.056	1625.9	1753.9	121.634	74.85	101.43	1669
140.000	12.334	.08107	18.0180	1100.167	2646.8	2776.6	129.214	76.01	103.16	1602
150.000	12.170	.08217	16.6535	1014.292	3685.1	3816.6	136.393	77.29	104.98	1539
160.000	12.006	.08329	15.4211	936.003	4741.8	4875.1	143.228	78.68	106.88	1479
170.000	11.841	.08445	14.3021	864.167	5817.7	5952.9	149.767	80.16	108.86	1420
180.000	11.675	.08565	13.2810	797.860	6914.0	7051.0	156.047	81.73	110.92	1364
190.000	11.508	.08690	12.3452	736.343	8031.4	8170.4	162.102	83.37	113.06	1310
200.000	11.339	.08819	11.4842	678.999	9171.0	9312.1	167.957	85.07	115.28	1258
210.000	11.169	.08953	10.6890	625.316	10333.8	10477.1	173.637	86.83	117.59	1207
220.000	10.997	.09093	9.9518	574.869	11520.7	11666.2	179.162	88.64	119.98	1157
230.000	10.823	.09240	9.2662	527.302	12732.7	12880.5	184.550	90.49	122.46	1108
240.000	10.646	.09393	8.6262	482.316	13970.8	14121.1	189.816	92.37	125.04	1059
250.000	10.465	.09555	8.0269	439.664	15236.1	15389.0	194.974	94.27	127.72	1012
260.000	10.280	.09727	7.4637	399.139	16529.7	16685.3	200.038	96.20	130.54	965
270.000	10.091	.09910	6.9327	360.569	17852.9	18011.4	205.019	98.14	133.49	918
280.000	9.896	.10106	6.4302	323.810	19207.1	19368.7	209.929	100.10	136.61	871
290.000	9.693	.10316	5.9527	288.749	20593.9	20758.9	214.780	102.05	139.93	825
300.000	9.483	.10545	5.4972	255.286	22015.4	22184.1	219.584	104.02	143.51	778
310.000	9.262	.10797	5.0606	223.334	23474.2	23646.9	224.352	105.98	147.42	731
320.000	9.029	.11076	4.6396	192.811	24973.6	25150.9	229.100	107.94	151.77	682
330.000	8.779	.11390	4.2308	163.635	26518.4	26700.7	233.844	109.90	156.74	633
340.000	8.510	.11751	3.8301	135.706	28115.4	28303.4	238.608	111.87	162.62	582
350.000	8.212	.12177	3.4317	108.884	29775.3	29970.1	243.423	113.85	169.99	528
360.000	7.874	.12700	3.0266	82.942	31516.6	31719.8	248.344	115.88	180.01	470
361.768	7.808	.12807	2.9532	78.421	31826.3	32031.2	249.240	116.24	182.23	459
361.768	.74695	1.339	.086319	13.126	43456.1	45598.2	286.741	112.76	149.56	173
370.000	.69938	1.430	.078077	15.276	44515.9	46803.7	290.037	113.86	144.05	182
380.000	.65406	1.529	.070784	17.532	45780.5	48226.8	293.833	115.70	141.08	191
390.000	.61741	1.620	.065193	19.539	47039.6	49631.0	297.481	117.76	140.01	199
400.000	.58666	1.705	.060694	21.371	48302.9	51030.2	301.024	119.92	139.96	207
410.000	.56020	1.785	.056956	23.073	49575.8	52431.9	304.486	122.15	140.52	213
420.000	.53702	1.862	.053782	24.673	50862.3	53841.8	307.883	124.42	141.49	219
430.000	.51641	1.936	.051039	26.189	52164.2	55262.5	311.226	126.69	142.73	225
440.000	.49790	2.008	.048636	27.637	53483.4	56696.9	314.524	128.98	144.17	230
450.000	.48111	2.079	.046509	29.027	54820.6	58146.2	317.781	131.25	145.74	235
460.000	.46577	2.147	.044607	30.368	56176.6	59611.7	321.002	133.52	147.41	240
470.000	.45167	2.214	.042893	31.666	57552.0	61094.4	324.191	135.77	149.16	244
480.000	.43863	2.280	.041339	32.927	58947.4	62595.1	327.350	138.01	150.96	248
490.000	.42652	2.345	.039921	34.156	60362.3	64113.6	330.482	140.22	152.79	253
500.000	.41522	2.408	.038620	35.356	61797.2	65650.6	333.587	142.41	154.64	257
520.000	.39471	2.534	.036311	37.681	64727.4	68781.0	339.725	146.71	158.39	264
540.000	.37651	2.656	.034319	39.924	67736.6	71986.1	345.774	150.91	162.15	271
560.000	.36020	2.776	.032576	42.099	70824.3	75266.2	351.738	154.99	165.87	278
580.000	.34547	2.895	.031035	44.218	73989.3	78620.7	357.623	158.96	169.55	284
600.000	.33206	3.012	.029659	46.290	77229.3	82047.7	363.432	162.82	173.16	291
620.000	.31978	3.127	.028421	48.322	80542.8	85546.2	369.168	166.56	176.70	296
640.000	.30849	3.242	.027299	50.320	83928.1	89114.7	374.833	170.19	180.15	302
660.000	.29804	3.355	.026275	52.289	87383.5	92751.8	380.428	173.72	183.53	308
680.000	.28836	3.468	.025336	54.232	90906.5	96455.2	385.956	177.13	186.81	313
700.000	.27933	3.580	.024470	56.152	94495.6	100223.5	391.418	180.45	190.02	318

120

Table 22. Continued

I-BUTANE ISOBAR AT P = 18 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.318	12.756	.07840	22.3261	1368.694	55.4	196.5	108.744	73.29	98.88	1782
120.000	12.663	.07897	21.2602	1302.878	619.0	761.1	113.562	73.81	99.78	1740
130.000	12.500	.08000	19.5545	1197.084	1623.2	1767.2	121.613	74.85	101.42	1670
140.000	12.336	.08106	18.0339	1102.140	2643.8	2789.8	129.192	76.01	103.16	1604
150.000	12.172	.08215	16.6690	1016.221	3681.8	3829.7	136.370	77.29	104.97	1540
160.000	12.008	.08328	15.4363	937.897	4738.2	4888.1	143.205	78.68	106.87	1480
170.000	11.843	.08444	14.3170	866.032	5813.8	5965.7	149.743	80.16	108.85	1422
180.000	11.677	.08564	13.2957	799.711	6909.6	7063.7	156.023	81.73	110.91	1366
190.000	11.511	.08688	12.3598	738.169	8026.6	8183.0	162.076	83.37	113.04	1312
200.000	11.342	.08816	11.4986	680.814	9165.8	9324.5	167.931	85.07	115.26	1259
210.000	11.173	.08950	10.7033	627.125	10328.1	10489.2	173.610	86.83	117.56	1208
220.000	11.001	.09090	9.9661	576.676	11514.5	11678.1	179.133	88.64	119.95	1158
230.000	10.827	.09236	9.2804	529.111	12725.9	12892.1	184.520	90.49	122.42	1109
240.000	10.650	.09390	8.6405	484.132	13963.3	14132.3	189.784	92.37	125.00	1061
250.000	10.470	.09551	8.0413	441.490	15227.9	15399.8	194.941	94.27	127.68	1014
260.000	10.285	.09722	7.4783	400.979	16520.6	16695.6	200.002	96.20	130.48	967
270.000	10.096	.09904	6.9476	362.428	17842.8	18021.1	204.981	98.14	133.42	920
280.000	9.902	.10099	6.4453	325.691	19195.8	19377.6	209.889	100.10	136.52	874
290.000	9.700	.10309	5.9683	290.657	20581.3	20766.9	214.737	102.05	139.83	827
300.000	9.491	.10537	5.5134	257.225	22001.2	22190.9	219.536	104.02	143.38	781
310.000	9.271	.10786	5.0774	225.311	23458.1	23652.2	224.300	105.98	147.25	733
320.000	9.039	.11063	4.6574	194.836	24955.0	25154.2	229.041	107.94	151.55	686
330.000	8.792	.11375	4.2498	165.718	26496.7	26701.4	233.777	109.90	156.43	637
340.000	8.524	.11731	3.8508	137.865	28089.4	28300.6	238.530	111.87	162.20	586
350.000	8.230	.12151	3.4548	111.150	29743.3	29962.0	243.331	113.85	169.34	533
360.000	7.898	.12662	3.0537	85.371	31475.5	31703.4	248.228	115.87	178.92	476
367.916	7.593	.13170	2.7225	65.389	32917.8	33154.8	252.244	117.57	189.90	426
367.916	.86079	1.162	.102502	11.854	43850.6	45941.7	286.999	115.28	159.29	167
370.000	.84353	1.185	.099295	12.502	44136.7	46270.6	287.890	115.41	156.42	170
380.000	.77627	1.288	.087596	15.222	45470.4	47789.1	291.941	116.74	148.53	182
390.000	.72536	1.379	.079355	17.533	46773.7	49255.2	295.750	118.56	145.18	192
400.000	.68434	1.461	.073034	19.590	48068.9	50699.1	299.406	120.59	143.84	200
410.000	.65003	1.536	.067950	21.468	49366.1	52135.2	302.953	122.71	143.58	207
420.000	.62057	1.611	.063732	23.211	50672.1	53572.6	306.417	124.90	143.99	214
430.000	.59480	1.681	.060152	24.848	51990.2	55016.4	309.814	127.12	144.82	220
440.000	.57193	1.748	.057063	26.399	53322.6	56469.8	313.155	129.35	145.95	226
450.000	.55141	1.814	.054359	27.879	54671.2	57935.6	316.450	131.59	147.28	231
460.000	.53282	1.877	.051966	29.298	56037.5	59415.7	319.703	133.83	148.76	236
470.000	.51585	1.939	.049829	30.667	57421.6	60911.0	322.919	136.05	150.35	241
480.000	.50025	1.999	.047906	31.992	58824.5	62422.7	326.102	138.26	152.02	246
490.000	.48584	2.058	.046162	33.278	60246.6	63951.5	329.254	140.45	153.74	250
500.000	.47246	2.117	.044571	34.530	61687.8	65497.6	332.378	142.62	155.51	254
520.000	.44331	2.231	.041770	36.947	64628.6	68643.6	338.547	146.89	159.11	262
540.000	.42702	2.342	.039373	39.268	67646.7	71861.9	344.620	151.06	162.75	269
560.000	.40805	2.451	.037292	41.510	70741.9	75153.1	350.604	155.12	166.39	276
580.000	.39097	2.558	.035463	43.689	73913.2	78517.1	356.506	159.07	170.00	283
600.000	.37549	2.663	.033838	45.813	77158.8	81952.5	362.329	162.92	173.55	289
620.000	.36136	2.767	.032382	47.892	80477.1	85458.3	368.077	166.65	177.04	295
640.000	.34839	2.870	.031068	49.932	83866.9	89033.6	373.752	170.27	180.46	301
660.000	.33642	2.972	.029873	51.939	87325.7	92676.1	379.357	173.78	183.80	307
680.000	.32534	3.074	.028781	53.917	90852.0	96384.7	384.892	177.19	187.06	312
700.000	.31504	3.174	.027777	55.869	94444.0	100157.6	390.361	180.50	190.24	318

Table 22. Continued

I-BUTANE ISOBAR AT P = 20 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.402	12.756	.07840	22.3272	1369.829	61.4	218.2	108.797	73.30	98.89	1783
120.000	12.664	.07896	21.2772	1304.973	616.6	774.5	113.542	73.81	99.77	1742
130.000	12.501	.07999	19.5709	1199.112	1620.5	1780.5	121.592	74.85	101.42	1671
140.000	12.338	.08105	18.0498	1104.113	2640.9	2803.0	129.171	76.01	103.15	1605
150.000	12.174	.08214	16.6845	1018.149	3678.5	3842.8	136.348	77.29	104.96	1542
160.000	12.010	.08326	15.4515	939.789	4734.5	4901.1	143.183	78.68	106.86	1481
170.000	11.845	.08442	14.3319	867.896	5809.8	5978.6	149.720	80.16	108.84	1423
180.000	11.680	.08562	13.3104	801.553	6905.2	7076.5	155.998	81.73	110.89	1367
190.000	11.513	.08686	12.3742	739.995	8021.9	8195.6	162.051	83.37	113.03	1313
200.000	11.345	.08814	11.5130	682.628	9160.6	9336.9	167.904	85.07	115.24	1261
210.000	11.176	.08948	10.7176	628.933	10322.4	10501.4	173.582	86.83	117.54	1210
220.000	11.004	.09087	9.9803	578.482	11508.2	11690.0	179.105	88.64	119.92	1160
230.000	10.831	.09233	9.2946	530.919	12719.1	12903.7	184.490	90.49	122.39	1111
240.000	10.654	.09386	8.6548	485.946	13955.8	14143.6	189.753	92.37	124.96	1063
250.000	10.474	.09547	8.0557	443.314	15219.6	15410.6	194.907	94.27	127.63	1016
260.000	10.290	.09718	7.4929	402.817	16511.5	16705.9	139.967	96.20	130.42	969
270.000	10.102	.09899	6.9624	364.283	17832.8	18030.7	204.944	98.14	133.35	922
280.000	9.908	.10093	6.4605	327.568	19184.7	19386.5	209.849	100.10	136.44	876
290.000	9.707	.10302	5.9839	292.561	20568.8	20774.9	214.693	102.05	139.72	830
300.000	9.498	.10528	5.5295	259.160	21987.2	22197.5	219.489	104.02	143.25	783
310.000	9.280	.10776	5.0942	227.284	23442.1	23657.6	224.247	105.98	147.08	736
320.000	9.049	.11051	4.6750	196.853	24936.6	25157.7	228.983	107.94	151.33	689
330.000	8.804	.11359	4.2687	167.792	26475.2	26702.4	233.711	109.90	156.14	640
340.000	8.539	.11711	3.8713	140.012	28063.8	28298.1	238.454	111.87	161.78	590
350.000	8.248	.12124	3.4777	113.398	29712.0	29954.4	243.240	113.85	168.73	537
360.000	7.921	.12625	3.0802	87.770	31435.4	31687.9	248.114	115.87	177.90	481
370.000	7.537	.13268	2.6648	62.806	33264.3	33529.7	253.161	118.03	191.68	418
373.569	7.378	.13553	2.5071	53.942	33952.8	34223.9	255.050	118.87	198.83	393
373.569	.98313	1.017	.120631	10.574	44188.1	46222.5	287.169	117.71	170.90	162
380.000	.91979	1.087	.108812	12.680	45107.6	47282.0	289.982	118.07	160.01	171
390.000	.84690	1.181	.096254	15.401	46476.0	48837.6	294.023	119.50	152.21	183
400.000	.79156	1.263	.087280	17.733	47813.3	50339.9	297.827	121.32	148.74	193
410.000	.74695	1.339	.080361	19.815	49141.1	51818.7	301.479	123.32	147.27	201
420.000	.70962	1.409	.074783	21.719	50470.1	53288.5	305.022	125.42	146.89	209
430.000	.67757	1.476	.070149	23.487	51806.8	54758.5	308.481	127.57	147.19	215
440.000	.64954	1.540	.066214	25.149	53154.7	56233.8	311.872	129.75	147.93	222
450.000	.62468	1.601	.062816	26.724	54516.2	57717.9	315.208	131.94	148.97	227
460.000	.60236	1.660	.059841	28.227	55893.2	59213.5	318.496	134.14	150.22	233
470.000	.58215	1.718	.057209	29.669	57287.1	60722.7	321.741	136.33	151.63	238
480.000	.56370	1.774	.054857	31.059	58698.3	62246.3	324.949	138.51	153.15	243
490.000	.54675	1.829	.052740	32.403	60127.9	63785.9	328.123	140.68	154.75	247
500.000	.53108	1.883	.050821	33.708	61575.6	65341.5	331.266	142.83	156.41	252
520.000	.50299	1.988	.047466	36.219	64527.4	68503.7	337.468	147.07	159.85	260
540.000	.47838	2.090	.044620	38.619	67555.2	71735.9	343.567	151.21	163.38	267
560.000	.45657	2.190	.042167	40.929	70658.1	75038.6	349.572	155.25	166.92	275
580.000	.43703	2.288	.040024	43.167	73836.1	78412.5	355.491	159.18	170.45	282
600.000	.41937	2.385	.038131	45.344	77087.3	81856.3	361.329	163.01	173.95	288
620.000	.40330	2.480	.036442	47.470	80410.6	85369.6	367.089	166.73	177.39	294
640.000	.38859	2.573	.034922	49.552	83804.7	88951.4	372.775	170.34	180.77	300
660.000	.37506	2.666	.033546	51.596	87267.3	92599.8	378.388	173.84	184.07	306
680.000	.36254	2.758	.032291	53.609	90797.0	96313.6	383.931	177.24	187.31	312
700.000	.35093	2.850	.031141	55.593	94392.0	100091.2	389.406	180.54	190.46	317

Table 22. Continued

I-BUTANE ISOBAR AT P = 22 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.486	12.756	.07840	22.3283	1370.968	67.4	239.8	108.849	73.31	98.89	1783
120.000	12.666	.07895	21.2942	1307.068	614.1	787.8	113.521	73.81	99.76	1743
130.000	12.503	.07998	19.5873	1201.140	1617.8	1793.8	121.571	74.85	101.41	1673
140.000	12.340	.08104	18.0658	1106.087	2637.9	2816.2	129.149	76.01	103.14	1606
150.000	12.176	.08213	16.7000	1020.078	3675.3	3855.9	136.326	77.29	104.95	1543
160.000	12.012	.08325	15.4666	941.682	4730.9	4914.1	143.160	78.68	106.85	1483
170.000	11.848	.08440	14.3467	869.760	5805.8	5991.5	149.696	80.16	108.82	1425
180.000	11.682	.08560	13.3250	803.394	6900.9	7089.2	155.974	81.73	110.88	1369
190.000	11.516	.08684	12.3887	741.820	8017.1	8208.2	162.026	83.37	113.01	1315
200.000	11.348	.08812	11.5273	684.442	9155.4	9349.3	167.878	85.07	115.22	1262
210.000	11.179	.08945	10.7318	630.739	10316.7	10513.5	173.555	86.83	117.52	1211
220.000	11.008	.09084	9.9945	580.286	11502.0	11701.9	179.076	88.64	119.89	1162
230.000	10.834	.09230	9.3089	532.725	12712.3	12915.3	184.460	90.49	122.36	1113
240.000	10.658	.09382	8.6691	487.758	13948.4	14154.8	189.721	92.37	124.92	1065
250.000	10.479	.09543	8.0701	445.136	15211.5	15421.4	194.874	94.27	127.58	1018
260.000	10.295	.09713	7.5074	404.652	16502.5	16716.2	199.932	96.20	130.37	971
270.000	10.107	.09894	6.9772	366.136	17822.8	18040.6	204.906	98.14	133.28	924
280.000	9.914	.10087	6.4756	329.443	19173.6	19395.5	209.809	100.10	136.36	878
290.000	9.714	.10295	5.9994	294.460	20556.4	20782.9	214.650	102.05	139.62	832
300.000	9.506	.10520	5.5455	261.091	21973.2	22204.6	219.442	104.02	143.12	786
310.000	9.288	.10766	5.1109	229.250	23426.2	23663.0	224.195	105.98	146.92	739
320.000	9.059	.11038	4.6926	198.864	24918.4	25161.3	228.925	107.94	151.12	692
330.000	8.815	.11344	4.2874	169.857	26454.0	26703.5	233.646	109.90	155.86	643
340.000	8.553	.11692	3.8915	142.148	28038.6	28295.8	238.379	111.87	161.39	593
350.000	8.265	.12099	3.5002	115.629	29681.2	29947.4	243.150	113.85	168.14	542
360.000	7.943	.12589	3.1062	90.142	31396.3	31673.3	248.004	115.87	176.94	486
370.000	7.568	.13214	2.6969	65.413	33211.2	33501.9	253.014	118.03	189.86	425
378.802	7.161	.13964	2.3027	43.814	34942.7	35249.9	257.698	120.18	209.58	362
378.802	1.11585	.896	.141122	9.289	44470.7	46442.3	287.245	120.09	185.32	157
380.000	1.09833	.910	.137615	9.768	44658.8	46661.8	287.824	120.00	181.08	159
390.000	.98737	1.013	.117035	13.103	46134.2	48362.3	292.242	120.63	162.45	174
400.000	.91098	1.098	.103992	15.786	47530.3	49945.3	296.251	122.15	155.17	185
410.000	.85247	1.173	.094506	18.109	48897.2	51477.9	300.036	123.98	151.81	195
420.000	.80508	1.242	.087132	20.195	50254.7	52987.4	303.674	125.97	150.33	203
430.000	.76532	1.307	.081159	22.108	51613.2	54487.9	307.205	128.04	149.91	211
440.000	.73113	1.368	.076181	23.889	52978.7	55987.7	310.653	130.16	150.16	217
450.000	.70119	1.426	.071943	25.565	54354.6	57492.1	314.035	132.31	150.84	223
460.000	.67460	1.482	.068278	27.155	55744.0	59005.2	317.360	134.46	151.82	229
470.000	.65072	1.537	.065066	28.673	57148.1	60529.0	320.637	136.62	153.01	235
480.000	.62908	1.590	.062220	30.130	58568.6	62065.8	323.873	138.78	154.36	240
490.000	.60931	1.641	.059677	31.535	60005.8	63616.4	327.070	140.92	155.82	244
500.000	.59115	1.692	.057385	32.894	61460.9	65182.4	330.234	143.05	157.37	249
520.000	.55876	1.790	.053410	35.459	64424.6	68361.8	336.469	147.25	160.63	258
540.000	.53061	1.885	.050068	37.979	67462.0	71608.2	342.595	151.36	164.02	266
560.000	.50578	1.977	.047208	40.358	70573.1	74922.8	348.622	155.38	167.47	273
580.000	.48364	2.068	.044724	42.655	73757.9	78306.7	354.559	159.29	170.92	280
600.000	.46370	2.157	.042540	44.984	77014.9	81759.3	360.411	163.10	174.36	287
620.000	.44562	2.244	.040601	47.056	80343.6	85280.5	366.184	166.81	177.75	293
640.000	.42911	2.330	.038863	49.180	83741.8	88868.7	371.880	170.41	181.08	299
660.000	.41395	2.416	.037294	51.262	87208.3	92523.0	377.502	173.90	184.35	305
680.000	.39996	2.500	.035867	53.309	90741.7	96242.3	383.054	177.30	187.56	311
700.000	.38699	2.584	.034563	55.324	94339.7	100024.6	388.536	180.59	190.68	317

123

Table 22.   Continued

I-BUTANE ISOBAR AT P =   24 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.569	12.756	.07839	22.3295	1372.110	73.3	261.4	108.901	73.31	98.90	1784
120.000	12.668	.07894	21.3112	1309.164	611.7	801.2	113.501	73.81	99.76	1744
130.000	12.505	.07997	19.6037	1203.168	1615.1	1807.1	121.550	74.85	101.40	1674
140.000	12.342	.08103	18.0817	1108.060	2634.9	2829.4	129.128	76.01	103.13	1608
150.000	12.178	.08211	16.7155	1022.006	3672.0	3869.0	136.304	77.29	104.94	1545
160.000	12.014	.08323	15.4818	943.574	4727.3	4927.1	143.137	78.68	106.84	1484
170.000	11.850	.08439	14.3616	871.623	5801.9	6004.4	149.673	80.16	108.81	1426
180.000	11.685	.08558	13.3397	805.235	6896.6	7102.0	155.950	81.73	110.86	1370
190.000	11.519	.08682	12.4032	743.644	8012.4	8220.8	162.001	83.37	112.99	1316
200.000	11.351	.08810	11.5416	686.254	9150.3	9361.7	167.852	85.07	115.20	1264
210.000	11.182	.08943	10.7460	632.545	10311.1	10525.7	173.528	86.83	117.49	1213
220.000	11.011	.09082	10.0087	582.090	11495.9	11713.8	179.048	88.64	119.86	1163
230.000	10.838	.09227	9.3230	534.530	12705.5	12926.9	184.430	90.49	122.33	1114
240.000	10.662	.09379	8.6833	489.569	13941.0	14166.1	189.690	92.37	124.88	1067
250.000	10.483	.09539	8.0844	446.956	15203.3	15432.2	194.841	94.27	127.54	1019
260.000	10.300	.09708	7.5220	406.485	16493.5	16726.5	199.897	96.20	130.31	973
270.000	10.113	.09888	6.9919	367.986	17812.9	18050.2	204.869	98.14	133.22	927
280.000	9.920	.10081	6.4906	331.314	19162.5	19404.5	209.769	100.10	136.28	880
290.000	9.721	.10287	6.0148	296.357	20544.1	20791.0	214.607	102.05	139.52	834
300.000	9.514	.10511	5.5615	263.017	21959.3	22211.6	219.395	104.02	143.00	788
310.000	9.297	.10756	5.1275	231.212	23410.5	23668.6	224.144	105.98	146.76	742
320.000	9.069	.11026	4.7101	200.868	24900.4	25165.0	228.868	107.94	150.91	695
330.000	8.827	.11329	4.3060	171.914	26433.0	26704.9	233.581	109.90	155.58	647
340.000	8.567	.11673	3.9116	144.271	28013.8	28293.9	238.304	111.87	161.00	597
350.000	8.283	.12074	3.5224	117.844	29651.0	29940.8	243.063	113.85	167.57	546
360.000	7.965	.12555	3.1316	92.489	31358.3	31659.6	247.896	115.87	176.04	491
370.000	7.598	.13162	2.7280	67.974	33160.1	33476.0	252.873	118.02	188.19	431
380.000	7.144	.13998	2.2875	43.815	35111.1	35447.1	258.139	120.49	209.41	361
383.671	6.938	.14413	2.1057	34.819	35897.9	36243.8	260.224	121.54	223.03	331
383.671	1.26152	.793	.164544	8.013	44698.4	46600.9	287.218	122.48	204.03	151
390.000	1.15666	.865	.143862	10.566	45726.0	47800.9	290.322	122.11	179.20	163
400.000	1.04663	.955	.124028	13.727	47212.0	49505.1	294.637	123.12	164.04	177
410.000	.96863	1.032	.110821	16.344	48631.0	51108.7	298.598	124.72	157.55	188
420.000	.90812	1.101	.101030	18.639	50023.8	52666.7	302.353	126.56	154.45	197
430.000	.85876	1.164	.093338	20.712	51408.4	54203.1	305.968	128.54	153.07	205
440.000	.81715	1.224	.087065	22.621	52794.0	55731.1	309.481	130.59	152.67	213
450.000	.78125	1.280	.081814	24.404	54186.5	57258.5	312.914	132.68	152.90	219
460.000	.74974	1.334	.077329	26.084	55589.4	58790.5	316.281	134.80	153.56	226
470.000	.72171	1.386	.073440	27.681	57004.9	60330.3	319.593	136.92	154.50	231
480.000	.69649	1.436	.070024	29.208	58435.2	61881.0	322.858	139.04	155.65	237
490.000	.67362	1.485	.066994	30.674	59880.9	63443.7	326.080	141.16	156.96	242
500.000	.65270	1.532	.064281	32.089	61343.1	65020.1	329.265	143.26	158.38	247
520.000	.61567	1.624	.059612	34.789	64319.7	68217.9	335.536	147.43	161.44	256
540.000	.58371	1.713	.055723	37.349	67367.3	71478.9	341.689	151.51	164.69	264
560.000	.55569	1.800	.052417	39.796	70486.8	74805.8	347.739	155.51	168.03	271
580.000	.53080	1.884	.049564	42.153	73678.7	78200.1	353.694	159.41	171.40	279
600.000	.50849	1.967	.047068	44.434	76941.7	81661.6	359.562	163.20	174.77	286
620.000	.48831	2.048	.044861	46.652	80275.6	85190.5	365.347	166.89	178.11	292
640.000	.46993	2.128	.042890	48.817	83678.3	88785.4	371.054	170.48	181.40	298
660.000	.45309	2.207	.041117	50.937	87148.7	92445.7	376.685	173.96	184.64	304
680.000	.43758	2.285	.039510	53.017	90685.6	96170.4	382.245	177.35	187.81	310
700.000	.42323	2.363	.038044	55.064	94286.7	99957.5	387.734	180.64	190.91	316

Table 22. Continued

I-BUTANE ISOBAR AT P = 26 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.652	12.756	.07839	22.3308	1373.256	79.2	283.0	108.952	73.32	98.91	1785
120.000	12.669	.07893	21.3282	1311.259	609.3	814.6	113.481	73.81	99.75	1746
130.000	12.506	.07996	19.6200	1205.196	1612.5	1820.3	121.529	74.85	101.39	1675
140.000	12.343	.08101	18.0975	1110.032	2631.9	2842.6	129.106	76.01	103.12	1609
150.000	12.180	.08210	16.7310	1023.934	3668.7	3882.2	136.282	77.29	104.93	1546
160.000	12.017	.08322	15.4969	945.466	4723.7	4940.1	143.114	78.68	106.83	1486
170.000	11.852	.08437	14.3764	873.486	5797.9	6017.3	149.649	8C.16	108.80	1428
180.000	11.687	.08556	13.3543	807.075	6892.2	7114.7	155.926	81.73	110.85	1372
190.000	11.521	.08680	12.4176	745.468	8007.7	8233.3	161.975	83.37	112.97	1318
200.000	11.354	.08807	11.5559	688.066	9145.1	9374.1	167.826	85.07	115.18	1266
210.000	11.185	.08940	10.7602	634.350	10305.5	10537.9	173.501	86.83	117.47	1215
220.000	11.015	.09079	10.0229	583.891	11489.7	11725.7	179.020	88.64	119.84	1165
230.000	10.842	.09223	9.3372	536.334	12698.8	12938.6	184.401	90.49	122.29	1116
240.000	10.666	.09375	8.6975	491.378	13933.6	14177.3	189.659	92.37	124.84	1068
250.000	10.488	.09535	8.0987	448.774	15195.2	15443.1	194.809	94.27	127.49	1021
260.000	10.305	.09704	7.5364	408.316	16484.6	16736.9	199.862	96.20	130.26	975
270.000	10.118	.09883	7.0066	369.834	17803.0	18059.9	204.832	98.14	133.15	929
280.000	9.926	.10075	6.5056	333.182	19151.6	19413.5	209.729	100.10	136.20	883
290.000	9.727	.10280	6.0302	298.249	20531.8	20799.1	214.564	102.06	139.42	837
300.000	9.521	.10503	5.5773	264.938	21945.6	22218.6	219.343	104.02	142.87	791
310.000	9.306	.10746	5.1441	233.168	23394.9	23674.2	224.093	105.98	146.61	744
320.000	9.079	.11014	4.7274	202.865	24882.5	25168.9	228.811	107.94	150.71	698
330.000	8.839	.11314	4.3244	173.962	26412.2	26706.4	233.517	109.90	155.31	650
340.000	8.581	.11654	3.9315	146.384	27989.3	28292.3	238.231	111.87	160.63	601
350.000	8.299	.12049	3.5443	120.043	29621.4	29934.7	242.976	113.85	167.03	550
360.000	7.986	.12521	3.1567	94.813	31321.1	31646.7	247.790	115.87	175.19	496
370.000	7.627	.13112	2.7582	70.493	33110.7	33451.6	252.736	118.02	186.67	437
380.000	7.188	.13912	2.3283	46.697	35037.8	35399.5	257.940	120.48	205.85	370
388.220	6.706	.14913	1.9131	26.828	36828.1	37215.8	262.658	122.97	240.75	300
388.220	1.42371	.702	.191696	6.721	44868.2	46694.5	287.073	124.91	229.64	145
390.000	1.37737	.726	.181928	7.624	45200.2	47087.9	288.085	124.38	213.62	150
400.000	1.20527	.830	.148829	11.524	46843.6	49000.8	292.930	124.29	177.21	168
410.000	1.09837	.910	.129925	14.512	48336.5	50703.7	297.136	125.54	165.08	181
420.000	1.02027	.980	.116801	17.048	49774.6	52323.0	301.039	127.21	159.50	191
430.000	.95977	1.043	.106878	19.298	51190.6	53902.4	304.756	129.07	156.76	200
440.000	.90815	1.101	.098990	21.346	52599.9	55462.8	308.344	131.04	155.53	208
450.000	.86522	1.156	.092508	23.242	54010.8	57015.8	311.834	133.07	155.20	215
460.000	.82803	1.208	.087051	25.018	55428.7	58568.7	315.247	135.14	155.46	222
470.000	.79528	1.257	.082371	26.696	56857.0	60126.3	318.597	137.22	156.11	228
480.000	.76607	1.305	.078300	28.294	58297.6	61691.6	321.893	139.31	157.04	234
490.000	.73974	1.352	.074715	29.823	59752.8	63267.5	325.142	141.40	158.16	239
500.000	.71582	1.397	.071526	31.294	61223.0	64855.2	328.350	143.49	159.44	244
520.000	.67375	1.484	.066085	34.090	64212.9	68071.9	334.658	147.61	162.29	253
540.000	.63771	1.568	.061592	36.730	67271.1	71348.2	340.840	151.67	165.38	262
560.000	.60629	1.649	.057801	39.246	70399.3	74687.7	346.913	155.64	168.61	270
580.000	.57853	1.729	.054548	41.661	73598.5	78092.6	352.886	159.52	171.89	277
600.000	.55372	1.806	.051717	43.994	76867.7	81563.2	358.769	163.29	175.19	284
620.000	.53136	1.882	.049224	46.259	80206.9	85100.4	364.568	166.97	178.47	291
640.000	.51105	1.957	.047007	48.465	83614.2	88701.8	370.285	170.55	181.72	298
660.000	.49247	2.031	.045018	50.621	87088.9	92368.4	375.926	174.03	184.92	304
680.000	.47540	2.103	.043220	52.735	90629.1	96098.1	381.494	177.40	188.06	310
700.000	.45963	2.176	.041584	54.812	94233.4	99890.1	386.983	180.69	191.14	315

Table 22. Continued

I-BUTANE ISOBAR AT P = 28 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.734	12.756	.07839	22.3321	1374.405	85.1	304.6	109.004	73.33	98.91	1785
120.000	12.671	.07892	21.3451	1313.354	606.9	827.9	113.460	73.81	99.74	1747
130.000	12.508	.07995	19.6364	1207.224	1609.8	1833.6	121.509	74.85	101.39	1677
140.000	12.345	.08100	18.1134	1112.005	2629.0	2855.8	129.085	76.01	103.11	1611
150.000	12.182	.08209	16.7464	1025.862	3665.4	3895.3	136.260	77.29	104.92	1547
160.000	12.019	.08320	15.5120	947.357	4720.1	4953.1	143.092	78.68	106.81	1487
170.000	11.855	.08436	14.3913	875.348	5794.0	6030.2	149.626	80.16	108.78	1429
180.000	11.690	.08554	13.3689	808.914	6887.9	7127.5	155.901	81.73	110.83	1373
190.000	11.524	.08678	12.4320	747.290	8003.0	8245.9	161.950	83.37	112.96	1319
200.000	11.357	.08805	11.5702	689.877	9139.9	9386.5	167.800	85.07	115.16	1267
210.000	11.188	.08938	10.7744	636.153	10299.8	10550.1	173.474	86.83	117.44	1216
220.000	11.018	.09076	10.0370	585.692	11483.6	11737.7	178.992	88.64	119.81	1167
230.000	10.846	.09220	9.3513	538.136	12692.0	12950.2	184.371	90.49	122.26	1118
240.000	10.670	.09372	8.7117	493.185	13926.2	14188.6	189.628	92.37	124.80	1070
250.000	10.492	.09531	8.1130	450.590	15187.1	15454.0	194.776	94.27	127.45	1023
260.000	10.310	.09699	7.5509	410.145	16475.7	16747.3	199.828	96.20	130.20	977
270.000	10.124	.09878	7.0212	371.679	17793.1	18069.7	204.795	98.14	133.09	931
280.000	9.932	.10068	6.5206	335.047	19140.7	19422.6	209.689	100.10	136.12	885
290.000	9.734	.10273	6.0455	300.138	20519.7	20807.3	214.521	102.06	139.33	839
300.000	9.529	.10495	5.5932	266.856	21931.9	22225.7	219.302	104.02	142.75	793
310.000	9.314	.10736	5.1605	235.119	23379.4	23680.0	224.042	105.98	146.45	747
320.000	9.089	.11002	4.7447	204.856	24864.8	25172.9	228.755	107.94	150.51	701
330.000	8.850	.11299	4.3427	176.002	26391.7	26708.1	233.454	109.90	155.05	653
340.000	8.594	.11636	3.9512	148.487	27965.1	28290.9	238.158	111.87	160.27	604
350.000	8.316	.12025	3.5660	122.228	29592.3	29929.0	242.891	113.85	166.51	554
360.000	8.007	.12489	3.1813	97.114	31284.8	31634.5	247.687	115.87	174.38	501
370.000	7.655	.13064	2.7876	72.974	33063.0	33428.8	252.604	118.02	185.26	443
380.000	7.230	.13831	2.3671	49.497	34968.6	35355.9	257.752	120.46	202.76	378
390.000	6.654	.15029	1.8728	25.904	37117.8	37538.7	263.437	123.53	242.81	295
392.483	6.457	.15486	1.7220	19.757	37744.5	38178.1	265.036	124.49	265.76	269
392.483	1.60784	.622	.223771	5.444	44973.3	46714.8	286.786	127.48	267.13	140
400.000	1.39956	.715	.181134	9.115	46399.2	48399.9	291.041	125.80	199.31	157
410.000	1.24608	.803	.152759	12.598	48005.0	50252.1	295.617	126.49	175.40	173
420.000	1.14354	.874	.134885	15.421	49503.3	51951.9	299.714	127.92	165.81	185
430.000	1.06644	.938	.122020	17.870	50958.2	53583.7	303.554	129.64	161.14	195
440.000	1.00476	.995	.112102	20.068	52395.2	55181.9	307.229	131.51	158.81	204
450.000	.95349	1.049	.104121	22.083	53827.3	56763.9	310.784	133.48	157.78	211
460.000	.90972	1.099	.097508	23.957	55262.0	58339.9	314.248	135.49	157.55	218
470.000	.87160	1.147	.091906	25.720	56704.0	59916.5	317.639	137.53	157.85	225
480.000	.83791	1.193	.087079	27.390	58156.4	61498.1	320.969	139.59	158.52	231
490.000	.80777	1.238	.082864	28.983	59621.2	63087.5	324.246	141.65	159.44	236
500.000	.78054	1.281	.079141	30.510	61100.2	64687.4	327.479	143.71	160.56	242
520.000	.73302	1.364	.072839	33.404	64104.0	67923.9	333.825	147.80	163.17	251
540.000	.69262	1.444	.067682	36.124	67173.4	71216.1	340.038	151.82	166.10	260
560.000	.65761	1.521	.063364	38.708	70310.7	74568.5	346.134	155.77	169.20	268
580.000	.62682	1.595	.059679	41.192	73517.4	77984.4	352.127	159.63	172.39	276
600.000	.59941	1.668	.056489	43.566	76793.3	81464.5	358.026	163.39	175.62	283
620.000	.57478	1.740	.053692	45.876	80137.6	85009.0	363.837	167.05	178.85	290
640.000	.55246	1.810	.051213	48.123	83549.6	88617.8	369.566	170.62	182.05	297
660.000	.53210	1.879	.048996	50.315	87028.4	92290.5	375.216	174.09	185.21	303
680.000	.51343	1.948	.046998	52.462	90572.2	96025.7	380.792	177.46	188.32	309
700.000	.49620	2.015	.045185	54.569	94180.0	99822.8	386.295	180.73	191.37	315

126

.

Table 22. Continued

I-BUTANE ISOBAR AT P = 30 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.817	12.756	.07839	22.3335	1375.557	90.9	326.1	109.054	73.34	98.92	1786
120.000	12.672	.07891	21.3621	1315.449	604.5	841.3	113.440	73.81	99.74	1748
130.000	12.510	.07994	19.6528	1209.251	1607.1	1846.9	121.488	74.85	101.38	1678
140.000	12.347	.08099	18.1293	1113.977	2626.0	2869.0	129.063	76.01	103.11	1612
150.000	12.184	.08207	16.7619	1027.789	3662.2	3908.4	136.238	77.29	104.91	1549
160.000	12.021	.08319	15.5271	949.248	4716.5	4966.1	143.069	78.68	106.80	1488
170.000	11.857	.08434	14.4061	877.210	5790.1	6043.1	149.603	80.16	108.77	1431
180.000	11.692	.08553	13.3835	810.753	6883.6	7140.2	155.877	81.73	110.82	1375
190.000	11.527	.08676	12.4464	749.112	7998.3	8258.5	161.925	83.37	112.94	1321
200.000	11.360	.08803	11.5845	691.687	9134.8	9398.9	167.774	85.07	115.14	1269
210.000	11.192	.08935	10.7886	637.956	10294.2	10562.3	173.447	86.83	117.42	1218
220.000	11.022	.09073	10.0511	587.492	11477.4	11749.6	178.963	88.64	119.78	1168
230.000	10.849	.09217	9.3655	539.936	12685.3	12961.9	184.342	90.49	122.23	1120
240.000	10.674	.09368	8.7259	494.990	13918.9	14199.9	189.597	92.37	124.77	1072
250.000	10.497	.09527	8.1273	452.404	15179.1	15464.9	194.743	94.27	127.40	1025
260.000	10.315	.09695	7.5653	411.972	16466.9	16757.7	199.793	96.20	130.15	979
270.000	10.129	.09873	7.0359	373.521	17783.4	18079.5	204.758	98.14	133.02	933
280.000	9.938	.10062	6.5355	336.909	19129.8	19431.7	209.650	100.10	136.04	887
290.000	9.741	.10266	6.0608	302.024	20507.6	20815.6	214.479	102.06	139.23	841
300.000	9.536	.10486	5.6089	268.769	21918.3	22232.9	219.256	104.02	142.63	796
310.000	9.323	.10726	5.1769	237.064	23364.0	23685.8	223.992	105.98	146.30	750
320.000	9.099	.10991	4.7618	206.841	24847.3	25177.0	228.699	107.94	150.32	703
330.000	8.861	.11285	4.3609	178.034	26371.5	26710.0	233.391	109.90	154.79	656
340.000	8.607	.11618	3.9707	150.579	27941.3	28289.8	238.087	111.87	159.92	608
350.000	8.332	.12002	3.5874	124.398	29563.6	29923.7	242.807	113.85	166.01	558
360.000	8.028	.12457	3.2054	99.393	31249.3	31623.0	247.586	115.87	173.62	506
370.000	7.682	.13018	2.8163	75.420	33016.8	33407.4	252.475	118.01	183.95	449
380.000	7.269	.13757	2.4041	52.226	34902.9	35315.6	257.574	120.45	200.04	386
390.000	6.726	.14867	1.9316	29.254	37002.3	37448.3	263.129	123.48	233.42	308
396.488	6.184	.16170	1.5290	13.561	38662.6	39147.7	267.403	126.13	304.85	237
396.488	1.823	.54862	.2627	4.176	45001.1	46646.9	286.318	130.31	327.50	134
400.000	1.660	.60259	.2275	6.359	45816.4	47624.2	288.772	128.09	246.34	145
410.000	1.419	.70476	.1808	10.585	47622.9	49737.2	293.993	127.61	190.53	164
420.000	1.281	.78079	.1559	13.756	49204.8	51547.2	298.356	128.70	173.93	178
430.000	1.183	.84522	.1391	16.427	50708.7	53244.4	302.350	130.24	166.41	190
440.000	1.108	.90273	.1266	18.787	52178.8	54887.0	306.127	132.01	162.59	199
450.000	1.047	.95555	.1168	20.928	53635.5	56502.1	309.757	133.90	160.66	207
460.000	.995	1.00494	.1088	22.906	55089.1	58103.9	313.277	135.85	159.85	215
470.000	.951	1.05168	.1021	24.754	56546.0	59701.1	316.713	137.85	159.74	222
480.000	.912	1.09631	.0964	26.498	58011.0	61299.9	320.079	139.87	160.11	228
490.000	.878	1.13923	.0915	28.156	59486.5	62904.2	323.387	141.91	160.80	234
500.000	.847	1.18072	.0871	29.740	60974.6	64516.7	326.645	143.94	161.74	239
520.000	.794	1.26023	.0799	32.731	63993.3	67773.9	333.032	147.98	164.09	249
540.000	.748	1.33610	.0740	35.531	67074.3	71082.6	339.276	151.98	166.84	259
560.000	.710	1.40918	.0691	38.183	70220.9	74448.5	345.396	155.90	169.81	267
580.000	.675	1.48004	.0650	40.715	73435.4	77875.5	351.409	159.74	172.91	275
600.000	.646	1.54910	.0614	43.150	76717.8	81365.1	357.324	163.49	176.06	282
620.000	.619	1.61668	.0583	45.505	80067.6	84917.7	363.149	167.14	179.23	289
640.000	.594	1.68303	.0555	47.791	83484.7	88533.8	368.889	170.69	182.38	296
660.000	.572	1.74834	.0531	50.020	86967.5	92212.5	374.549	174.15	185.50	302
680.000	.552	1.81276	.0508	52.199	90514.9	95953.2	380.132	177.51	188.58	308
700.000	.533	1.87641	.0468	54.336	94125.9	99755.1	385.642	180.78	191.60	314

127

Table 22. Continued

I-BUTANE ISOBAR AT P = 32 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.899	12.756	.07839	22.3349	1376.713	96.8	347.6	109.105	73.34	98.93	1787
120.000	12.674	.07890	21.3790	1317.545	602.1	854.6	113.420	73.81	99.73	1750
130.000	12.511	.07993	19.6691	1211.279	1604.4	1860.2	121.467	74.85	101.37	1680
140.000	12.349	.08098	18.1451	1115.950	2623.1	2882.2	129.042	76.01	103.10	1613
150.000	12.186	.08206	16.7773	1029.716	3658.9	3921.5	136.216	77.29	104.90	1550
160.000	12.023	.08317	15.5422	951.139	4713.0	4979.1	143.046	78.68	106.79	1490
170.000	11.859	.08432	14.4209	879.071	5786.1	6056.0	149.579	80.16	108.76	1432
180.000	11.695	.08551	13.3980	812.591	6879.4	7153.0	155.853	81.73	110.80	1376
190.000	11.529	.08674	12.4608	750.933	7993.6	8271.1	161.900	83.37	112.92	1322
200.000	11.363	.08801	11.5987	693.496	9129.7	9411.3	167.748	85.07	115.12	1270
210.000	11.195	.08933	10.8028	639.757	10288.6	10574.5	173.420	86.83	117.40	1219
220.000	11.025	.09070	10.0652	589.290	11471.3	11761.6	178.935	88.64	119.76	1170
230.000	10.853	.09214	9.3796	541.735	12678.7	12973.5	184.312	90.49	122.20	1121
240.000	10.679	.09365	8.7400	496.794	13911.6	14211.3	189.566	92.37	124.73	1074
250.000	10.501	.09523	8.1415	454.217	15171.0	15475.8	194.711	94.27	127.36	1027
260.000	10.320	.09690	7.5796	413.796	16458.0	16768.1	199.759	96.20	130.10	981
270.000	10.134	.09867	7.0504	375.361	17773.6	18089.4	204.722	98.14	132.96	935
280.000	9.944	.10056	6.5503	338.771	19119.0	19440.8	209.611	100.10	135.96	889
290.000	9.747	.10259	6.0760	303.905	20495.2	20823.9	214.437	102.06	139.13	844
300.000	9.544	.10478	5.6246	270.678	21904.8	22240.1	219.210	104.02	142.51	798
310.000	9.331	.10717	5.1931	239.005	23348.8	23691.7	223.942	105.98	146.15	753
320.000	9.108	.10979	4.7789	208.820	24829.9	25181.2	228.643	107.94	150.13	706
330.000	8.873	.11271	4.3789	180.059	26351.4	26712.1	233.329	109.90	154.54	660
340.000	8.621	.11600	3.9901	152.661	27917.8	28289.0	238.016	111.87	159.58	612
350.000	8.348	.11979	3.6086	126.555	29535.5	29918.8	242.725	113.85	165.53	562
360.000	8.048	.12426	3.2292	101.653	31214.6	31612.2	247.487	115.87	172.89	510
370.000	7.708	.12974	2.8442	77.832	32972.0	33387.2	252.350	118.01	182.74	455
380.000	7.307	.13686	2.4397	54.892	34840.4	35278.3	257.404	120.45	197.63	393
390.000	6.791	.14725	1.9850	32.430	36898.2	37369.4	262.851	123.43	226.18	319
400.000	5.909	.16924	1.3535	8.917	39503.3	40044.9	269.618	127.75	363.15	208
400.253	5.869	.17039	1.3293	8.238	39608.6	40153.8	269.835	127.94	377.21	204
400.253	2.085	.47964	.3118	2.917	44925.8	46460.6	285.592	133.68	440.62	128
410.000	1.630	.61357	.2169	8.438	47165.9	49129.4	292.189	129.02	215.07	155
420.000	1.436	.69640	.1807	12.049	48872.1	51100.5	296.941	129.57	184.75	171
430.000	1.311	.76301	.1584	14.973	50439.1	52880.7	301.131	130.90	172.85	184
440.000	1.218	.82102	.1426	17.508	51949.4	54576.6	305.030	132.54	166.98	194
450.000	1.145	.87351	.1305	19.782	53434.2	56229.5	308.744	134.34	163.92	203
460.000	1.084	.92212	.1209	21.866	54909.0	57859.8	312.328	136.23	162.38	211
470.000	1.033	.96781	.1130	23.802	56383.0	59480.0	315.813	138.18	161.79	218
480.000	.989	1.01122	.1063	25.621	57861.6	61097.5	319.218	140.16	161.81	225
490.000	.950	1.05278	.1005	27.344	59348.5	62717.4	322.558	142.16	162.24	231
500.000	.915	1.09282	.0956	28.986	60846.0	64343.0	325.843	144.17	162.98	237
520.000	.855	1.16927	.0872	32.073	63880.3	67621.9	332.273	148.17	165.04	247
540.000	.805	1.24193	.0806	34.953	66973.4	70947.6	338.549	152.14	167.60	257
560.000	.762	1.31170	.0750	37.672	70130.1	74327.5	344.695	156.03	170.44	266
580.000	.725	1.37920	.0704	40.262	73352.5	77765.9	350.727	159.85	173.43	274
600.000	.692	1.44487	.0664	42.747	76641.6	81265.2	356.659	163.58	176.50	281
620.000	.663	1.50903	.0629	45.145	79997.2	84826.1	362.497	167.22	179.61	288
640.000	.636	1.57194	.0599	47.471	83419.1	88449.3	368.248	170.76	182.71	295
660.000	.612	1.63390	.0572	49.735	86906.1	92134.3	373.918	174.21	185.80	302
680.000	.590	1.69476	.0548	51.947	90457.5	95880.8	379.510	177.57	188.84	308
700.000	.570	1.75495	.0526	54.112	94071.5	99687.4	385.027	180.83	191.83	314

Table 22. Continued

I-BUTANE ISCBAR AT P = 34 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
114.980	12.757	.07839	22.3364	1377.872	102.6	369.1	109.155	73.35	98.94	1788
120.000	12.675	.07889	21.3959	1319.640	599.7	868.0	113.400	73.81	99.73	1751
130.000	12.513	.07992	19.6854	1213.306	1601.8	1873.5	121.446	74.85	101.36	1681
140.000	12.351	.08097	18.1610	1117.922	2620.1	2895.4	129.021	76.01	103.09	1615
150.000	12.188	.08205	16.7928	1031.643	3655.7	3934.6	136.194	77.29	104.89	1552
160.000	12.025	.08316	15.5573	953.029	4709.4	4992.1	143.024	78.68	106.78	1491
170.000	11.861	.08431	14.4357	880.932	5782.2	6068.9	149.556	8C.16	108.75	1433
180.000	11.697	.08549	13.4126	814.429	6875.1	7165.7	155.829	81.73	110.79	1378
190.000	11.532	.08672	12.4752	752.754	7988.9	8283.7	161.875	83.37	112.91	1324
200.000	11.366	.08798	11.6130	695.3C4	9124.6	9423.7	167.722	85.07	115.10	1272
210.000	11.198	.08930	10.8169	641.558	10283.1	10586.2	173.393	86.83	117.38	1221
220.000	11.028	.09068	10.0793	591.087	11465.2	11773.5	178.907	88.64	119.73	1172
230.000	10.857	.09211	9.3936	543.533	12672.0	12985.2	184.283	90.49	122.17	1123
240.000	10.683	.09361	8.7541	498.596	13904.3	14222.6	189.535	92.37	124.69	1076
250.000	10.505	.09519	8.1557	456.027	15163.1	15486.7	194.678	94.27	127.31	1029
260.000	10.325	.09686	7.5940	415.618	16449.3	16778.6	199.724	96.20	130.04	983
270.000	10.140	.09862	7.0650	377.198	17763.9	18099.3	204.685	98.14	132.89	937
280.000	9.950	.10050	6.5651	340.627	19108.3	19450.0	209.572	100.10	135.88	891
290.000	9.754	.10252	6.0912	305.784	20483.6	20832.2	214.395	102.06	139.04	846
300.000	9.551	.10470	5.6402	272.583	21891.5	22247.4	219.164	104.02	142.40	801
310.000	9.340	.10707	5.2094	240.941	23333.7	23697.7	223.892	105.98	146.01	755
320.000	9.118	.10967	4.7958	210.793	24812.7	25185.6	228.588	107.94	149.94	709
330.000	8.884	.11257	4.3968	182.076	26331.6	26714.3	233.268	109.90	154.30	663
340.000	8.634	.11583	4.0092	154.733	27894.6	28288.5	237.946	111.87	159.25	615
350.000	8.364	.11956	3.6295	128.698	29507.8	29914.3	242.644	113.85	165.07	566
360.000	8.067	.12396	3.2526	103.894	31180.6	31602.1	247.390	115.87	172.20	515
370.000	7.733	.12932	2.8715	80.215	32928.5	33368.2	252.229	118.01	181.61	460
380.000	7.342	.13620	2.4739	57.502	34780.6	35243.7	257.241	120.44	195.46	400
390.000	6.850	.14598	2.0343	35.468	36803.1	37299.4	262.596	123.40	220.38	330
400.000	6.090	.16421	1.4712	13.311	39235.6	39793.9	268.907	127.29	302.67	233
403.797	5.469	.18285	1.1132	3.844	40643.3	41265.0	272.499	130.02	565.23	169
403.797	2.433	.41101	.3790	1.664	44685.7	46083.1	284.431	138.37	727.28	122
410.000	1.907	.52448	.2668	6.095	46582.3	48365.5	290.048	130.92	262.61	145
420.000	1.615	.61910	.2105	10.297	48494.3	50599.3	295.434	130.58	199.87	164
430.000	1.451	.68911	.1805	13.511	50145.9	52488.9	299.882	131.61	180.86	178
440.000	1.337	.74816	.1604	16.234	51705.2	54249.0	303.928	133.09	172.14	190
450.000	1.249	.80069	.1456	18.647	53222.9	55945.3	307.741	134.79	167.60	199
460.000	1.178	.84879	.1340	20.840	54721.7	57607.7	311.395	136.61	165.18	208
470.000	1.119	.89367	.1246	22.866	56214.2	59252.7	314.933	138.51	164.01	215
480.000	1.068	.93606	.1168	24.761	57707.7	60890.3	318.381	140.45	163.63	222
490.000	1.024	.97647	.1101	26.548	59206.8	62526.8	321.756	142.42	163.77	229
500.000	.985	1.01527	.1044	28.248	60714.9	64166.8	325.069	144.40	164.28	235
520.000	.918	1.08905	.0949	31.432	63765.6	67468.4	331.544	148.36	166.03	246
540.000	.863	1.15890	.0874	34.390	66871.4	70811.7	337.852	152.29	168.38	255
560.000	.816	1.22577	.0812	37.175	70038.2	74205.8	344.024	156.16	171.08	264
580.000	.775	1.29031	.0760	39.822	73268.8	77655.9	350.077	159.96	173.96	272
600.000	.739	1.35298	.0716	42.357	76564.8	81164.9	356.025	163.68	176.96	280
620.000	.707	1.41413	.0677	44.799	79924.2	84734.2	361.877	167.30	180.00	287
640.000	.678	1.47400	.0644	47.163	83353.1	88364.7	367.640	170.83	183.05	294
660.000	.652	1.53282	.0614	49.462	86844.4	92056.0	373.320	174.27	186.09	301
680.000	.629	1.59072	.0587	51.705	90399.6	95808.0	378.920	177.62	189.10	307
700.000	.607	1.64785	.0563	53.899	94016.9	99619.6	384.444	180.87	192.07	313

Table 22. Continued

I-BUTANE ISOBAR AT P = 35 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.021	12.757	.07839	22.3371	1378.452	105.4	379.8	109.181	73.35	98.94	1788
120.000	12.676	.07889	21.4044	1320.688	598.5	874.7	113.390	73.81	99.72	1752
130.000	12.514	.07991	19.6936	1214.320	1600.5	1880.1	121.436	74.85	101.36	1682
140.000	12.351	.08096	18.1689	1118.908	2618.6	2902.0	129.010	76.01	103.08	1615
150.000	12.189	.08204	16.8005	1032.607	3654.1	3941.2	136.183	77.29	104.89	1552
160.000	12.026	.08315	15.5648	953.974	4707.6	4998.7	143.012	78.68	106.78	1492
170.000	11.863	.08430	14.4431	881.862	5780.3	6075.3	149.544	80.16	108.74	1434
180.000	11.698	.08548	13.4199	815.348	6872.9	7172.1	155.817	81.73	110.78	1378
190.000	11.533	.08671	12.4824	753.664	7986.6	8290.0	161.863	83.37	112.90	1325
200.000	11.367	.08797	11.6201	696.208	9122.0	9430.0	167.709	85.07	115.09	1272
210.000	11.199	.08929	10.8239	642.458	10280.3	10592.8	173.379	86.83	117.36	1222
220.000	11.030	.09066	10.0863	591.985	11462.2	11779.5	178.893	88.64	119.72	1172
230.000	10.859	.09209	9.4007	544.431	12668.7	12991.0	184.268	90.49	122.15	1124
240.000	10.685	.09359	8.7611	499.497	13900.7	14228.3	189.520	92.37	124.67	1076
250.000	10.508	.09517	8.1628	456.932	15159.1	15492.2	194.662	94.27	127.29	1030
260.000	10.327	.09683	7.6011	416.528	16444.9	16783.8	199.707	96.20	130.02	984
270.000	10.142	.09860	7.0722	378.115	17759.1	18104.2	204.667	98.14	132.86	938
280.000	9.953	.10048	6.5725	341.553	19102.9	19454.6	209.552	100.10	135.85	893
290.000	9.757	.10249	6.0988	306.722	20477.7	20836.4	214.374	102.06	139.00	847
300.000	9.555	.10466	5.6480	273.533	21884.8	22251.1	219.142	104.02	142.34	802
310.000	9.344	.10702	5.2174	241.907	23326.2	23700.8	223.867	105.98	145.94	757
320.000	9.123	.10962	4.8043	211.777	24804.2	25187.8	228.561	107.94	149.85	711
330.000	8.889	.11250	4.4057	183.082	26321.8	26715.5	233.237	109.90	154.18	664
340.000	8.640	.11574	4.0188	155.766	27883.1	28288.2	237.911	111.87	159.09	617
350.000	8.371	.11945	3.6398	129.765	29494.1	29912.2	242.603	113.85	164.84	568
360.000	8.077	.12382	3.2642	105.008	31163.9	31597.2	247.342	115.87	171.87	517
370.000	7.745	.12911	2.8850	81.395	32907.2	33359.1	252.170	118.01	181.07	463
380.000	7.359	.13588	2.4905	58.787	34751.7	35227.3	257.162	120.43	194.46	404
390.000	6.878	.14540	2.0577	36.943	36758.3	37267.2	262.476	123.38	217.88	335
400.000	6.160	.16234	1.5184	15.272	39130.4	39698.6	268.628	127.16	286.30	243
405.487	5.197	.19241	.9904	2.046	41247.4	41920.8	274.067	131.29	851.10	151
405.487	2.674	.37395	.4260	1.032	44447.9	45756.7	283.527	142.11	1139.47	119
410.000	2.091	.47832	.3012	4.808	46205.5	47879.6	288.740	132.25	309.18	139
420.000	1.717	.58247	.2280	9.403	48283.8	50322.5	294.631	131.14	209.89	160
430.000	1.527	.65477	.1928	12.778	49989.1	52280.8	299.241	131.98	185.64	175
440.000	1.399	.71457	.1701	15.601	51577.0	54078.0	303.373	133.38	175.07	187
450.000	1.303	.76724	.1537	18.085	53113.0	55798.4	307.240	135.02	169.62	197
460.000	1.227	.81518	.1410	20.333	54625.2	57478.4	310.933	136.81	166.69	206
470.000	1.163	.85972	.1308	22.404	56127.7	59136.7	314.500	138.68	165.19	214
480.000	1.109	.90167	.1223	24.337	57629.1	60784.9	317.970	140.60	164.59	221
490.000	1.062	.94158	.1151	26.158	59134.7	62430.2	321.363	142.55	164.57	227
500.000	1.021	.97983	.1090	27.885	60648.1	64077.5	324.691	144.52	164.96	234
520.000	.950	1.05241	.0989	31.117	63707.5	67390.9	331.189	148.46	166.54	245
540.000	.892	1.12097	.0908	34.115	66820.0	70743.4	337.515	152.37	168.79	254
560.000	.843	1.18652	.0843	36.933	69991.9	74144.8	343.699	156.23	171.40	264
580.000	.800	1.24971	.0788	39.607	73226.6	77600.5	349.763	160.02	174.23	272
600.000	.763	1.31101	.0742	42.167	76526.0	81114.6	355.719	163.72	177.19	280
620.000	.730	1.37077	.0702	44.630	79890.6	84688.3	361.578	167.34	180.20	287
640.000	.700	1.42926	.0667	47.014	83320.1	88322.5	367.347	170.87	183.22	294
660.000	.673	1.48668	.0635	49.330	86813.5	92016.9	373.031	174.30	186.24	301
680.000	.648	1.54319	.0608	51.588	90370.6	95771.8	378.636	177.64	189.23	307
700.000	.625	1.59892	.0583	53.796	93989.7	99585.9	384.164	180.90	192.19	313

Table 22. Continued

I-BUTANE ISOBAR AT P =36.54885 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.084	12.757	.07839	22.3383	1379.353	109.9	396.4	109.219	73.36	98.94	1789
120.000	12.677	.07888	21.4175	1322.311	596.7	885.0	113.374	73.81	99.72	1753
130.000	12.515	.07990	19.7062	1215.890	1598.4	1890.4	121.420	74.85	101.36	1683
140.000	12.353	.08095	18.1811	1120.435	2616.4	2912.2	128.994	76.01	103.08	1616
150.000	12.190	.08203	16.8124	1034.099	3651.6	3951.4	136.166	77.29	104.88	1553
160.000	12.028	.08314	15.5765	955.437	4704.9	5008.7	142.995	78.68	106.77	1493
170.000	11.864	.08429	14.4545	883.302	5777.3	6085.3	149.526	8[.16	108.73	1435
180.000	11.700	.08547	13.4311	816.770	6869.6	7182.0	155.798	81.73	110.77	1380
190.000	11.535	.08669	12.4935	755.073	7983.0	8299.8	161.844	83.37	112.88	1326
200.000	11.369	.08796	11.6311	697.607	9118.1	9439.6	167.689	85.07	115.08	1274
210.000	11.202	.08927	10.8349	643.851	10276.0	10602.3	173.359	86.83	117.35	1223
220.000	11.033	.09064	10.0972	593.376	11457.5	11788.8	178.871	88.64	119.70	1174
230.000	10.861	.09207	9.4115	545.822	12663.6	13000.1	184.245	90.49	122.13	1125
240.000	10.688	.09357	8.7720	500.891	13895.1	14237.0	189.496	92.37	124.65	1078
250.000	10.511	.09514	8.1737	458.332	15152.9	15500.7	194.637	94.27	127.26	1031
260.000	10.331	.09680	7.6122	417.937	16438.1	16791.9	199.681	96.20	129.98	985
270.000	10.146	.09856	7.0834	379.536	17751.7	18111.9	204.639	98.14	132.82	940
280.000	9.957	.10043	6.5840	342.987	19094.7	19461.7	209.522	100.10	135.79	894
290.000	9.762	.10244	6.1105	308.173	20468.5	20842.9	214.342	102.06	138.92	849
300.000	9.560	.10460	5.6601	275.004	21874.5	22256.8	219.107	104.02	142.25	804
310.000	9.350	.10695	5.2299	243.401	23314.6	23705.5	223.829	105.98	145.83	759
320.000	9.130	.10953	4.8173	213.298	24791.0	25191.3	228.519	107.94	149.71	713
330.000	8.898	.11239	4.4194	184.637	26306.6	26717.4	233.190	109.90	154.00	667
340.000	8.650	.11561	4.0334	157.360	27865.5	28288.0	237.858	111.87	158.85	620
350.000	8.383	.11929	3.6558	131.412	29473.2	29909.1	242.542	113.85	164.50	571
360.000	8.091	.12359	3.2820	106.724	31138.3	31590.0	247.269	115.87	171.37	521
370.000	7.764	.12880	2.9055	83.210	32874.8	33345.6	252.079	118.01	180.28	467
380.000	7.385	.13540	2.5157	60.755	34708.1	35202.9	257.042	120.43	193.01	409
390.000	6.918	.14454	2.0924	39.177	36692.2	37220.5	262.299	123.37	214.42	342
400.000	6.253	.15993	1.5826	18.116	38989.4	39574.0	268.254	127.02	268.47	256
410.000	2.522	.39644	.3841	2.528	45358.0	46806.9	285.957	135.61	511.51	128
420.000	1.895	.52764	.2594	7.993	47920.4	49848.8	293.239	132.11	230.54	154
430.000	1.654	.60452	.2139	11.641	49730.2	51939.6	298.221	132.60	194.34	171
440.000	1.502	.66579	.1863	14.626	51369.4	53802.8	302.505	133.84	180.12	184
450.000	1.391	.71884	.1670	17.223	52937.6	55564.8	306.465	135.40	173.03	194
460.000	1.304	.76664	.1523	19.558	54471.7	57273.7	310.222	137.12	169.19	203
470.000	1.233	.81076	.1407	21.700	55991.0	58954.2	313.836	138.95	167.12	211
480.000	1.174	.85211	.1311	23.691	57505.3	60619.7	317.343	141.83	166.14	219
490.000	1.122	.89131	.1231	25.562	59021.4	62279.0	320.764	142.76	165.85	226
500.000	1.077	.92877	.1163	27.334	60543.5	63938.1	324.116	144.70	166.04	232
520.000	1.000	.99963	.1051	30.639	63616.6	67270.1	330.651	148.60	167.35	243
540.000	.938	1.06637	.0964	33.697	66739.5	70637.0	337.004	152.49	169.42	253
560.000	.885	1.13001	.0893	36.565	69919.6	74049.7	343.209	156.33	171.92	263
580.000	.839	1.19125	.0833	39.283	73161.1	77515.0	349.289	160.10	174.66	271
600.000	.800	1.25058	.0783	41.879	76466.1	81036.8	355.259	163.80	177.54	279
620.000	.764	1.30835	.0740	44.375	79835.0	84616.9	361.129	167.40	180.50	286
640.000	.733	1.36484	.0702	46.788	83268.4	88256.8	366.906	170.92	183.49	293
660.000	.704	1.42025	.0669	49.130	86765.3	91956.2	372.598	174.35	186.47	300
680.000	.678	1.47475	.0639	51.412	90325.4	95715.4	378.209	177.69	189.44	307
700.000	.654	1.52846	.0613	53.642	93947.0	99533.4	383.743	180.93	192.37	313

131

Table 22. Continued

I-BUTANE ISOBAR AT P = 38 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.143	12.757	.07839	22.3395	1380.199	114.1	412.0	109.255	73.37	98.95	1789
120.000	12.678	.07888	21.4297	1323.831	595.0	894.7	113.360	73.81	99.71	1754
130.000	12.516	.07990	19.7181	1217.361	1596.5	1900.1	121.405	74.85	101.35	1684
140.000	12.354	.08094	18.1926	1121.866	2614.2	2921.8	128.978	76.01	103.07	1617
150.000	12.192	.08202	16.8236	1035.496	3649.2	3960.9	136.150	77.29	104.88	1554
160.000	12.029	.08313	15.5874	956.808	4702.3	5018.2	142.979	78.68	106.76	1494
170.000	11.866	.08427	14.4652	884.652	5774.4	6094.7	149.509	80.16	108.72	1436
180.000	11.702	.08545	13.4417	818.102	6866.6	7191.3	155.781	81.73	110.76	1381
190.000	11.537	.08668	12.5039	756.393	7979.6	8309.0	161.826	83.37	112.87	1327
200.000	11.371	.08794	11.6414	698.918	9114.4	9448.6	167.671	85.07	115.06	1275
210.000	11.204	.08925	10.8451	645.156	10272.0	10611.1	173.339	86.83	117.33	1224
220.000	11.035	.09062	10.1074	594.678	11453.1	11797.5	178.851	88.64	119.68	1175
230.000	10.864	.09205	9.4217	547.124	12658.8	13008.6	184.224	90.49	122.10	1127
240.000	10.691	.09354	8.7822	502.196	13889.8	14245.3	189.474	92.37	124.62	1079
250.000	10.514	.09511	8.1840	459.642	15147.2	15508.6	194.613	94.27	127.23	1033
260.000	10.334	.09677	7.6225	419.256	16431.8	16799.5	199.656	96.20	129.94	987
270.000	10.150	.09852	7.0939	380.865	17744.7	18119.1	204.613	98.14	132.77	941
280.000	9.961	.10039	6.5946	344.330	19087.0	19468.5	209.494	100.10	135.74	896
290.000	9.767	.10239	6.1214	309.530	20459.9	20849.0	214.311	102.06	138.86	851
300.000	9.566	.10454	5.6713	276.380	21865.0	22262.2	219.074	104.02	142.17	806
310.000	9.356	.10688	5.2415	244.799	23303.8	23710.0	223.793	105.98	145.73	760
320.000	9.137	.10945	4.8294	214.721	24778.8	25194.7	228.480	107.94	149.58	715
330.000	8.905	.11229	4.4322	186.089	26292.6	26719.3	233.147	109.90	153.83	669
340.000	8.659	.11548	4.0471	158.850	27849.1	28287.9	237.809	111.87	158.62	622
350.000	8.394	.11913	3.6706	132.948	29453.7	29906.4	242.485	113.85	164.19	574
360.000	8.105	.12339	3.2984	108.322	31114.7	31583.5	247.201	115.87	170.91	524
370.000	7.781	.12851	2.9244	84.896	32845.1	33333.4	251.996	118.01	179.56	471
380.000	7.409	.13497	2.5388	62.575	34668.4	35181.3	256.934	120.43	191.73	414
390.000	6.955	.14379	2.1235	41.221	36633.3	37179.7	262.140	123.35	211.56	348
400.000	6.328	.15803	1.6357	20.620	38874.5	39475.1	267.949	126.93	256.55	267
410.000	4.297	.23275	.7248	.530	42466.0	43350.4	277.408	143.27	2344.08	122
420.000	2.094	.47755	.2954	6.643	47525.1	49339.7	291.913	133.16	258.95	149
430.000	1.785	.56025	.2361	10.578	49467.7	51596.7	297.226	133.22	204.33	167
440.000	1.604	.62329	.2028	13.721	51164.5	53532.9	301.679	134.29	185.54	180
450.000	1.477	.67686	.1803	16.427	52766.4	55338.5	305.737	135.75	176.55	191
460.000	1.380	.72465	.1636	18.844	54323.6	57077.3	309.559	137.42	171.71	201
470.000	1.301	.76846	.1505	21.052	55859.4	58779.5	313.221	139.20	169.05	209
480.000	1.236	.80933	.1398	23.098	57386.8	60462.3	316.763	141.05	167.67	217
490.000	1.179	.84794	.1310	25.016	58913.3	62135.4	320.214	142.95	167.10	224
500.000	1.130	.88474	.1234	26.828	60444.0	63806.0	323.589	144.87	167.09	230
520.000	1.048	.95413	.1112	30.202	63530.6	67156.3	330.159	148.74	168.13	242
540.000	.981	1.01929	.1017	33.315	66663.8	70536.7	336.538	152.61	170.03	252
560.000	.925	1.08129	.0940	36.229	69851.3	73960.2	342.763	156.43	172.40	262
580.000	.877	1.14085	.0877	38.987	73099.1	77434.4	348.859	160.18	175.06	270
600.000	.834	1.19848	.0823	41.617	76409.3	80963.6	354.841	163.87	177.88	278
620.000	.797	1.25454	.0776	44.144	79782.9	84550.2	360.721	167.46	180.79	286
640.000	.764	1.30930	.0736	46.584	83219.8	88195.1	366.507	170.97	183.74	293
660.000	.734	1.36297	.0701	48.950	86720.2	91899.5	372.206	174.39	186.69	300
680.000	.706	1.41572	.0669	51.254	90282.8	95662.6	377.823	177.72	189.63	306
700.000	.681	1.46769	.0641	53.503	93907.2	99484.4	383.362	180.97	192.54	312

132

Table 22. Continued

I-BUTANE ISOBAR AT P = 40 BAR

T	DEN	VOL	DP/DT	DP/DD	E	H	S	CV	CP	W
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
115.223	12.757	.07839	22.3411	1381.368	119.8	433.3	109.305	73.37	98.96	1790
120.000	12.680	.07887	21.4466	1325.927	592.6	908.0	113.339	73.81	99.71	1755
130.000	12.518	.07989	19.7344	1219.389	1593.8	1913.4	121.384	74.85	101.34	1685
140.000	12.356	.08093	18.2084	1123.837	2611.3	2935.0	128.957	76.01	103.06	1619
150.000	12.194	.08201	16.8390	1037.422	3646.0	3974.0	136.129	77.29	104.87	1556
160.000	12.031	.08312	15.6025	958.697	4698.7	5031.2	142.956	78.68	106.75	1495
170.000	11.868	.08426	14.4800	886.511	5770.6	6107.6	149.486	80.16	108.71	1438
180.000	11.705	.08544	13.4562	819.938	6862.3	7204.1	155.757	81.73	110.74	1382
190.000	11.540	.08666	12.5182	758.211	7975.4	8321.6	161.801	83.37	112.86	1328
200.000	11.374	.08792	11.6555	700.723	9109.4	9461.0	167.645	85.07	115.04	1276
210.000	11.207	.08923	10.8592	646.953	10266.5	10623.4	173.312	86.83	117.31	1226
220.000	11.038	.09059	10.1214	596.471	11447.1	11809.5	178.823	88.64	119.65	1176
230.000	10.868	.09202	9.4357	548.918	12652.2	13020.3	184.195	90.49	122.07	1128
240.000	10.695	.09351	8.7963	503.993	13882.6	14256.7	189.443	92.37	124.58	1081
250.000	10.518	.09507	8.1981	461.447	15139.3	15519.6	194.581	94.27	127.19	1034
260.000	10.339	.09672	7.6368	421.071	16423.1	16810.0	199.622	96.20	129.89	988
270.000	10.156	.09847	7.1084	382.694	17735.2	18129.0	204.577	98.14	132.71	943
280.000	9.967	.10033	6.6093	346.177	19076.4	19477.8	209.456	100.10	135.66	898
290.000	9.773	.10232	6.1364	311.399	20448.2	20857.5	214.270	102.06	138.77	853
300.000	9.573	.10446	5.6867	278.273	21851.9	22269.7	219.030	104.02	142.06	808
310.000	9.364	.10679	5.2575	246.720	23289.1	23716.3	223.745	105.98	145.59	763
320.000	9.146	.10934	4.8461	216.676	24762.0	25199.4	228.426	107.94	149.41	718
330.000	8.916	.11216	4.4498	188.085	26273.4	26722.0	233.087	109.90	153.61	672
340.000	8.672	.11532	4.0658	160.895	27826.8	28288.0	237.741	111.87	158.32	625
350.000	8.409	.11892	3.6908	135.055	29427.3	29903.0	242.407	113.85	163.78	578
360.000	8.123	.12311	3.3208	110.511	31082.7	31575.1	247.109	115.87	170.31	528
370.000	7.805	.12813	2.9501	87.199	32805.0	33317.5	251.883	118.00	178.63	476
380.000	7.440	.13441	2.5697	65.047	34615.4	35153.0	256.788	120.42	190.11	420
390.000	7.002	.14283	2.1643	43.968	36556.4	37127.7	261.934	123.33	208.09	357
400.000	6.418	.15582	1.7010	23.881	38735.3	39358.6	267.580	126.84	244.51	281
410.000	5.305	.18851	1.0552	5.000	41076.8	41830.8	273.603	138.44	462.85	169
420.000	2.448	.40844	.3612	4.749	46847.4	48481.1	289.657	134.91	327.34	140
430.000	1.988	.50293	.2717	9.124	49067.5	51079.2	295.775	134.14	222.11	161
440.000	1.757	.56911	.2282	12.493	50863.2	53139.6	300.514	134.94	194.33	175
450.000	1.603	.62370	.2003	15.351	52519.2	55014.0	304.727	136.26	182.00	187
460.000	1.489	.67162	.1802	17.881	54111.8	56798.3	308.649	137.84	175.51	197
470.000	1.398	.71513	.1648	20.179	55673.0	58533.5	312.381	139.55	171.89	206
480.000	1.324	.75545	.1524	22.300	57219.5	60241.3	315.977	141.36	169.90	214
490.000	1.260	.79335	.1422	24.281	58761.1	61934.5	319.469	143.22	168.92	221
500.000	1.206	.82933	.1337	26.149	60304.2	63621.6	322.877	145.11	168.60	228
520.000	1.115	.89690	.1199	29.615	63410.1	66997.7	329.498	148.94	169.24	240
540.000	1.042	.96008	.1093	32.804	66557.4	70397.2	335.914	152.76	170.88	251
560.000	.980	1.02002	.1007	35.761	69756.4	73836.5	342.167	156.56	173.09	260
580.000	.928	1.07747	.0937	38.592	73013.2	77323.1	348.284	160.30	175.62	269
600.000	.883	1.13295	.0878	41.269	76330.7	80862.6	354.284	163.96	178.35	277
620.000	.843	1.18684	.0828	43.837	79710.5	84457.8	360.178	167.54	181.19	285
640.000	.807	1.23942	.0784	46.313	83152.6	88110.3	365.976	171.04	184.09	292
660.000	.775	1.29091	.0745	48.712	86657.5	91821.1	371.685	174.45	187.00	299
680.000	.745	1.34146	.0711	51.045	90224.3	95590.2	377.311	177.78	189.90	306
700.000	.719	1.39123	.0681	53.322	93851.9	99416.8	382.857	181.01	192.78	312

133

Table 22. Continued

I-BUTANE ISOBAR AT P = 42 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.304	12.757	.07839	22.3428	1382.539	125.5	454.7	109.354	73.38	98.96	1791
120.000	12.681	.07886	21.4635	1328.023	590.2	921.4	113.319	73.81	99.70	1756
130.000	12.520	.07988	19.7508	1221.431	1591.2	1926.6	121.363	74.85	101.34	1686
140.000	12.358	.08092	18.2242	1125.809	2608.4	2948.3	128.936	76.01	103.06	1620
150.000	12.196	.08200	16.8544	1039.348	3642.8	3987.1	136.107	77.29	104.86	1557
160.000	12.033	.08310	15.6175	960.586	4695.2	5044.2	142.934	78.68	106.74	1497
170.000	11.871	.08424	14.4947	888.370	5766.7	6120.5	149.463	80.16	108.70	1439
180.000	11.707	.08542	13.4707	821.774	6858.1	7216.8	155.733	81.73	110.73	1384
190.000	11.543	.08664	12.5325	760.029	7970.3	8334.2	161.776	83.37	112.84	1330
200.000	11.377	.08790	11.6697	702.528	9104.3	9473.5	167.619	85.07	115.02	1278
210.000	11.210	.08920	10.8732	648.750	10260.9	10635.6	173.286	86.83	117.29	1227
220.000	11.042	.09056	10.1354	598.264	11441.1	11821.5	178.795	88.64	119.62	1178
230.000	10.871	.09199	9.4497	550.710	12645.6	13032.0	184.166	90.49	122.04	1130
240.000	10.698	.09347	8.8103	505.789	13875.5	14268.0	189.413	92.37	124.55	1083
250.000	10.523	.09503	8.2122	463.250	15131.6	15530.6	194.549	94.27	127.14	1036
260.000	10.344	.09668	7.6510	422.885	16414.5	16820.6	199.588	96.20	129.84	990
270.000	10.161	.09842	7.1227	384.522	17725.7	18139.0	204.541	98.14	132.65	945
280.000	9.973	.10027	6.6239	348.021	19065.9	19487.1	209.417	100.10	135.59	900
290.000	9.780	.10225	6.1514	313.264	20436.5	20866.0	214.229	102.06	138.68	855
300.000	9.580	.10439	5.7021	280.162	21838.8	22277.3	218.985	104.02	141.96	811
310.000	9.372	.10670	5.2734	248.637	23274.5	23722.6	223.696	105.98	145.45	766
320.000	9.155	.10923	4.8627	218.626	24745.4	25204.2	228.373	107.94	149.24	721
330.000	8.927	.11202	4.4672	190.074	26254.4	26724.9	233.028	109.90	153.39	675
340.000	8.684	.11515	4.0843	162.931	27804.7	28288.3	237.674	111.87	158.03	629
350.000	8.424	.11871	3.7109	137.150	29401.3	29899.9	242.330	113.85	163.37	581
360.000	8.141	.12284	3.3429	112.683	31051.3	31567.2	247.019	115.87	169.74	532
370.000	7.827	.12776	2.9752	89.478	32765.9	33302.5	251.774	118.00	177.75	481
380.000	7.470	.13386	2.5997	67.481	34564.3	35126.5	256.648	120.42	188.62	426
390.000	7.046	.14193	2.2032	46.644	36483.9	37080.0	261.738	123.32	205.07	365
400.000	6.496	.15393	1.7597	26.973	38612.4	39258.9	267.253	126.77	235.57	293
410.000	5.599	.17860	1.1978	8.872	40660.9	41411.0	272.490	137.64	349.10	196
420.000	2.981	.33546	.4616	2.957	45896.2	47305.1	286.679	137.04	477.66	133
430.000	2.227	.44908	.3146	7.698	48611.6	50497.7	294.202	135.15	246.64	155
440.000	1.925	.51936	.2570	11.295	50537.4	52718.7	299.310	135.62	205.00	171
450.000	1.738	.57527	.2223	14.304	52258.3	54674.4	303.706	136.78	188.24	184
460.000	1.604	.62351	.1982	16.946	53890.9	56509.6	307.740	138.26	179.72	194
470.000	1.500	.66684	.1801	19.333	55480.2	58280.9	311.550	139.91	174.97	203
480.000	1.415	.70671	.1658	21.527	57047.5	60015.7	315.202	141.67	172.28	212
490.000	1.344	.74400	.1541	23.571	58605.6	61730.4	318.738	143.49	170.83	219
500.000	1.283	.77927	.1444	25.493	60161.9	63434.9	322.182	145.35	170.19	226
520.000	1.183	.84521	.1289	29.050	63288.0	66837.8	328.855	149.13	170.39	238
540.000	1.103	.90661	.1171	32.311	66449.9	70257.6	335.309	152.92	171.76	249
560.000	1.037	.96468	.1077	35.350	69660.6	73712.3	341.591	156.69	173.79	259
580.000	.980	1.02022	.1000	38.213	72926.6	77211.5	347.730	160.41	176.20	268
600.000	.931	1.07376	.0935	40.936	76251.6	80761.4	353.747	164.05	178.83	277
620.000	.888	1.12568	.0880	43.544	79637.6	84365.5	359.656	167.62	181.60	284
640.000	.850	1.17629	.0832	46.056	83085.1	88025.5	365.466	171.11	184.44	292
660.000	.816	1.22579	.0791	48.487	86594.6	91742.9	371.186	174.51	187.30	299
680.000	.785	1.27435	.0754	50.849	90165.3	95517.6	376.820	177.83	190.17	305
700.000	.756	1.32213	.0721	53.151	93796.4	99349.4	382.373	181.06	193.02	312

134

Table 22. Continued

I-BUTANE ISOBAR AT P = 44 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MCL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.384	12.757	.07839	22.3445	1383.714	131.1	476.0	109.403	73.39	98.97	1791
120.000	12.683	.07885	21.4804	1330.118	587.8	934.8	113.299	73.81	99.69	1758
130.000	12.521	.07986	19.7670	1223.458	1588.5	1939.9	121.343	74.85	101.33	1688
140.000	12.360	.08091	18.2400	1127.780	2605.5	2961.5	128.915	76.01	103.05	1621
150.000	12.198	.08198	16.8697	1041.274	3639.5	4000.3	136.085	77.29	104.85	1558
160.000	12.035	.08309	15.6325	962.474	4691.7	5057.3	142.911	78.68	106.73	1498
170.000	11.873	.08423	14.5095	890.228	5762.8	6133.4	149.440	80.16	108.68	1441
180.000	11.709	.08540	13.4852	823.608	6853.8	7229.6	155.709	81.73	110.72	1385
190.000	11.545	.08662	12.5468	761.845	7965.7	8346.8	161.751	83.37	112.82	1331
200.000	11.380	.08787	11.6839	704.332	9099.3	9485.9	167.594	85.07	115.01	1279
210.000	11.213	.08918	10.8873	650.545	10255.5	10647.8	173.259	86.83	117.26	1229
220.000	11.045	.09054	10.1494	600.055	11435.1	11833.5	178.768	88.64	119.60	1180
230.000	10.875	.09195	9.4636	552.501	12639.1	13043.7	184.137	90.49	122.01	1132
240.000	10.702	.09344	8.8242	507.584	13868.3	14279.4	189.382	92.37	124.51	1084
250.000	10.527	.09499	8.2262	465.051	15123.6	15541.6	194.517	94.27	127.10	1038
260.000	10.348	.09663	7.6651	424.696	16405.9	16831.1	199.554	96.20	129.79	992
270.000	10.166	.09837	7.1371	386.347	17716.2	18149.0	204.505	98.14	132.59	947
280.000	9.979	.10021	6.6385	349.863	19055.5	19496.4	209.379	100.10	135.52	902
290.000	9.786	.10219	6.1663	315.125	20425.0	20874.6	214.188	102.06	138.59	858
300.000	9.587	.10431	5.7174	282.047	21825.9	22284.9	218.941	104.02	141.85	813
310.000	9.380	.10661	5.2893	250.550	23259.9	23729.0	223.648	105.98	145.32	769
320.000	9.164	.10912	4.8792	220.571	24729.0	25209.1	228.320	107.94	149.07	723
330.000	8.937	.11189	4.4845	192.056	26235.5	26727.9	232.969	109.91	153.17	678
340.000	8.696	.11499	4.1027	164.959	27782.9	28288.9	237.608	111.87	157.75	632
350.000	8.438	.11851	3.7307	139.235	29375.7	29897.1	242.254	113.85	162.99	585
360.000	8.158	.12257	3.3647	114.841	31020.5	31559.8	246.930	115.87	169.19	537
370.000	7.849	.12740	2.9999	91.735	32727.7	33288.3	251.666	118.00	176.91	486
380.000	7.499	.13334	2.6290	69.880	34514.9	35101.6	256.512	120.41	187.24	432
390.000	7.087	.14110	2.2403	49.257	36415.1	37035.9	261.553	123.30	202.42	372
400.000	6.567	.15228	1.8132	29.931	38501.7	39171.7	266.959	126.71	228.60	304
410.000	5.789	.17275	1.3014	12.366	40386.6	41146.7	271.760	137.26	304.84	217
420.000	3.794	.26359	.6202	2.362	44595.3	45755.1	282.846	138.44	613.56	134
430.000	2.513	.39794	.3675	6.340	48084.2	49835.1	292.463	136.22	281.24	150
440.000	2.112	.47341	.2898	10.139	50183.4	52266.5	298.056	136.33	218.03	167
450.000	1.883	.53097	.2467	13.292	51982.1	54318.3	302.668	137.32	195.39	180
460.000	1.725	.57967	.2177	16.043	53660.7	56211.2	306.830	138.69	184.37	191
470.000	1.605	.62293	.1965	18.516	55280.7	58021.6	310.724	140.27	178.31	201
480.000	1.510	.66244	.1800	20.781	56870.8	59785.6	314.438	141.98	174.82	209
490.000	1.430	.69920	.1667	22.886	58446.5	61522.9	318.020	143.76	172.85	217
500.000	1.363	.73383	.1557	24.861	60016.7	63245.0	321.501	145.59	171.84	224
520.000	1.253	.79831	.1383	28.505	63163.9	66676.5	328.229	149.32	171.57	237
540.000	1.165	.85810	.1252	31.838	66341.4	70117.0	334.722	153.08	172.66	248
560.000	1.094	.91448	.1148	34.936	69564.0	73587.7	341.032	156.82	174.50	258
580.000	1.033	.96827	.1064	37.851	72839.3	77099.7	347.194	160.52	176.78	267
600.000	.980	1.02003	.0993	40.618	76172.0	80660.2	353.230	164.15	179.32	276
620.000	.934	1.07017	.0934	43.265	79564.4	84273.5	359.153	167.70	182.01	284
640.000	.894	1.11897	.0882	45.811	83017.5	87941.0	364.975	171.18	184.79	291
660.000	.857	1.16667	.0837	48.273	86531.4	91664.7	370.705	174.57	187.61	298
680.000	.824	1.21342	.0797	50.664	90106.2	95445.2	376.347	177.88	190.44	305
700.000	.794	1.25938	.0762	52.992	93741.0	99282.3	381.909	181.10	193.26	311

135

Table 22. Continued

I-BUTANE ISOBAR AT P = 46 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.464	12.757	.07839	22.3463	1384.892	136.8	497.3	109.452	73.39	98.98	1792
120.000	12.684	.07884	21.4972	1332.214	585.5	948.1	113.279	73.82	99.69	1759
130.000	12.523	.07985	19.7833	1225.484	1585.9	1953.2	121.322	74.85	101.32	1689
140.000	12.361	.08090	18.2558	1129.751	2602.6	2974.7	128.893	76.01	103.04	1623
150.000	12.200	.08197	16.8851	1043.199	3636.3	4013.4	136.063	77.29	104.84	1560
160.000	12.038	.08307	15.6475	964.362	4688.2	5070.3	142.889	78.68	106.72	1500
170.000	11.875	.08421	14.5242	892.086	5759.0	6146.3	149.417	80.16	108.67	1442
180.000	11.712	.08538	13.4996	825.442	6849.6	7242.4	155.685	81.73	110.70	1386
190.000	11.548	.08660	12.5611	763.662	7961.1	8359.5	161.727	83.37	112.81	1333
200.000	11.383	.08785	11.6980	706.135	9094.3	9498.4	167.568	85.07	114.99	1281
210.000	11.216	.08915	10.9013	652.339	10250.0	10660.1	173.232	86.83	117.24	1230
220.000	11.048	.09051	10.1634	601.845	11429.1	11845.6	178.740	88.64	119.57	1181
230.000	10.879	.09192	9.4776	554.291	12632.6	13055.4	184.108	90.49	121.98	1133
240.000	10.706	.09340	8.8382	509.376	13861.2	14290.8	189.352	92.37	124.48	1086
250.000	10.531	.09495	8.2402	466.851	15115.8	15552.6	194.485	94.27	127.06	1040
260.000	10.353	.09659	7.6793	426.506	16397.4	16841.7	199.521	96.20	129.74	994
270.000	10.171	.09832	7.1514	388.169	17706.8	18159.1	204.469	98.14	132.53	949
280.000	9.984	.10016	6.6531	351.702	19045.1	19505.8	209.341	100.10	135.45	904
290.000	9.792	.10212	6.1811	316.984	20413.4	20883.2	214.147	102.06	138.51	860
300.000	9.594	.10423	5.7327	283.929	21813.0	22292.5	218.897	104.02	141.74	815
310.000	9.388	.10652	5.3050	252.458	23245.5	23735.5	223.600	105.98	145.19	771
320.000	9.173	.10901	4.8956	222.510	24712.7	25214.1	228.268	107.94	148.90	726
330.000	8.947	.11176	4.5018	194.032	26216.9	26731.0	232.911	109.91	152.96	681
340.000	8.708	.11483	4.1210	166.979	27761.4	28289.6	237.543	111.87	157.47	635
350.000	8.453	.11831	3.7503	141.309	29350.4	29894.6	242.180	113.85	162.61	589
360.000	8.176	.12231	3.3863	116.985	30990.2	31552.8	246.843	115.87	168.66	541
370.000	7.871	.12705	3.0242	93.972	32690.4	33274.8	251.561	118.00	176.13	491
380.000	7.528	.13284	2.6574	72.246	34467.0	35078.1	256.380	120.41	185.96	438
390.000	7.127	.14031	2.2759	51.814	36349.6	36995.0	261.376	123.29	200.05	380
400.000	6.631	.15082	1.8627	32.778	38400.6	39094.3	266.689	126.67	222.97	315
410.000	5.932	.16857	1.3860	15.615	40175.4	40950.9	271.199	137.02	280.34	234
420.000	4.513	.22158	.7909	3.535	43555.1	44574.3	279.920	137.88	502.80	148
430.000	2.864	.34920	.4336	5.148	47467.4	49073.7	290.519	137.29	328.77	145
440.000	2.321	.43081	.3275	9.043	49797.9	51779.6	296.744	137.05	233.93	162
450.000	2.040	.49028	.2736	12.323	51689.7	53945.0	301.612	137.86	203.58	176
460.000	1.853	.53957	.2389	15.176	53420.5	55902.5	305.915	139.13	189.52	188
470.000	1.716	.58285	.2141	17.730	55074.9	57756.0	309.902	140.64	181.91	198
480.000	1.608	.62208	.1951	20.064	56689.5	59551.1	313.681	142.29	177.52	207
490.000	1.519	.65938	.1799	22.227	58283.8	61312.3	317.313	144.03	174.97	215
500.000	1.444	.69244	.1675	24.253	59869.0	63054.2	320.832	145.83	173.56	222
520.000	1.323	.75559	.1481	27.982	63038.3	66514.0	327.618	149.51	172.79	235
540.000	1.229	.81391	.1336	31.385	66231.8	69975.7	334.150	153.24	173.58	247
560.000	1.151	.86873	.1222	34.541	69466.3	73462.5	340.491	156.95	175.22	257
580.000	1.086	.92093	.1130	37.505	72751.4	76987.7	346.676	160.63	177.36	266
600.000	1.030	.97108	.1053	40.315	76091.9	80558.9	352.729	164.24	179.80	275
620.000	.981	1.01958	.0988	43.000	79490.8	84180.9	358.667	167.78	182.42	283
640.000	.937	1.06673	.0933	45.580	82949.4	87856.4	364.502	171.25	185.15	291
660.000	.899	1.11277	.0884	48.073	86468.2	91586.9	370.241	174.63	187.92	298
680.000	.864	1.15786	.0841	50.490	90046.8	95373.0	375.893	177.93	190.71	305
700.000	.832	1.20216	.0803	52.843	93685.2	99215.1	381.461	181.15	193.50	311

136

Table 22. Continued

I-BUTANE ISOBAR AT P = 48 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.544	12.758	.07839	22.3481	1386.073	142.4	518.6	109.500	73.40	98.98	1793
120.000	12.686	.07883	21.5141	1334.310	583.1	961.5	113.259	73.82	99.68	1760
130.000	12.524	.07984	19.7996	1227.511	1583.3	1966.5	121.302	74.85	101.31	1690
140.000	12.363	.08089	18.2715	1131.722	2599.7	2987.9	128.872	76.01	103.03	1624
150.000	12.201	.08196	16.9004	1045.124	3633.1	4026.5	136.042	77.29	104.83	1561
160.000	12.040	.08306	15.6625	966.250	4684.6	5083.3	142.866	78.68	106.70	1501
170.000	11.877	.08419	14.5389	893.944	5755.1	6159.2	149.394	80.16	108.66	1443
180.000	11.714	.08537	13.5141	827.276	6845.4	7255.2	155.661	81.73	110.69	1388
190.000	11.550	.08658	12.5754	765.477	7956.5	8372.1	161.702	83.37	112.79	1334
200.000	11.386	.08783	11.7121	707.937	9089.3	9510.8	167.542	85.07	114.97	1282
210.000	11.219	.08913	10.9153	654.133	10244.5	10672.4	173.206	86.83	117.22	1232
220.000	11.052	.09048	10.1773	603.634	11423.2	11857.5	178.712	88.64	119.55	1183
230.000	10.882	.09189	9.4915	556.079	12626.1	13067.2	184.079	90.49	121.95	1135
240.000	10.710	.09337	8.8521	511.168	13854.1	14302.3	189.322	92.37	124.44	1088
250.000	10.536	.09492	8.2542	468.648	15108.1	15563.7	194.454	94.28	127.02	1042
260.000	10.358	.09655	7.6934	428.313	16388.9	16852.3	199.487	96.20	129.69	996
270.000	10.176	.09827	7.1657	389.989	17697.4	18169.1	204.434	98.14	132.47	951
280.000	9.990	.10010	6.6676	353.538	19034.8	19515.2	209.303	100.10	135.38	906
290.000	9.799	.10205	6.1960	318.839	20402.0	20891.8	214.107	102.06	138.42	862
300.000	9.601	.10415	5.7479	285.806	21800.3	22300.2	218.853	104.02	141.64	818
310.000	9.396	.10643	5.3207	254.362	23231.2	23742.0	223.553	105.98	145.06	773
320.000	9.182	.10891	4.9119	224.444	24696.5	25219.2	228.215	107.94	148.74	729
330.000	8.958	.11164	4.5189	196.001	26198.5	26734.3	232.853	109.91	152.75	684
340.000	8.720	.11468	4.1391	168.991	27740.1	28290.6	237.478	111.87	157.20	639
350.000	8.467	.11811	3.7698	143.373	29325.5	29892.4	242.106	113.85	162.25	592
360.000	8.193	.12206	3.4075	119.115	30960.5	31546.4	246.757	115.87	168.15	545
370.000	7.892	.12671	3.0480	96.189	32654.0	33262.2	251.458	118.00	175.38	495
380.000	7.555	.13237	2.6852	74.583	34420.6	35056.0	256.252	120.41	184.77	443
390.000	7.165	.13957	2.3102	54.322	36287.0	36957.0	261.206	123.28	197.93	387
400.000	6.689	.14949	1.9089	35.534	38307.1	39024.7	266.440	126.63	218.30	324
410.000	6.049	.16531	1.4586	18.686	40000.9	40794.5	270.736	136.87	264.44	249
420.000	4.953	.20191	.9302	5.870	42940.6	43909.8	278.237	137.10	389.45	169
430.000	3.289	.30406	.5158	4.389	46762.4	48221.9	288.336	138.16	379.11	143
440.000	2.556	.39124	.3709	8.036	49377.3	51255.3	295.365	137.77	253.06	159
450.000	2.208	.45282	.3034	11.406	51380.2	53553.7	300.533	138.41	212.90	173
460.000	1.989	.50280	.2619	14.349	53170.4	55583.8	304.995	139.57	195.17	185
470.000	1.831	.54615	.2329	16.980	54862.4	57483.9	309.083	141.00	185.79	196
480.000	1.709	.58515	.2111	19.378	56503.5	59312.3	312.932	142.60	180.39	205
490.000	1.610	.62105	.1939	21.597	58117.7	61098.7	316.616	144.30	177.20	213
500.000	1.528	.65461	.1799	23.671	59718.4	62860.6	320.176	146.07	175.36	221
520.000	1.396	.71654	.1583	27.482	62911.0	66350.4	327.020	149.70	174.05	234
540.000	1.293	.77351	.1423	30.951	66121.0	69833.8	333.593	153.39	174.52	246
560.000	1.209	.82691	.1298	34.163	69368.0	73337.2	339.964	157.08	175.96	256
580.000	1.139	.87764	.1197	37.175	72663.0	76875.6	346.172	160.74	177.96	266
600.000	1.080	.92629	.1114	40.028	76011.4	80457.6	352.244	164.33	180.30	274
620.000	1.027	.97323	.1044	42.749	79416.9	84088.7	358.197	167.86	182.84	283
640.000	.981	1.01892	.0984	45.362	82881.0	87771.9	364.044	171.32	185.50	290
660.000	.940	1.06344	.0932	47.884	86404.6	91509.1	369.793	174.69	188.23	297
680.000	.903	1.10701	.0886	50.329	89987.3	95300.9	375.453	177.98	190.98	304
700.000	.870	1.14978	.0845	52.706	93629.2	99148.1	381.029	181.19	193.74	311

Table 22. Continued

I-BUTANE ISCBAR AT P = 50 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.623	12.758	.07838	22.3499	1387.257	147.9	539.9	109.548	73.41	98.99	1793
120.000	12.687	.07882	21.5309	1336.406	580.7	974.8	113.239	73.82	99.68	1762
130.000	12.526	.07983	19.8158	1229.537	1580.7	1979.8	121.281	74.85	101.31	1692
140.000	12.365	.08087	18.2873	1133.693	2596.8	3001.1	128.851	76.01	103.02	1625
150.000	12.203	.08194	16.9157	1047.049	3629.9	4039.7	136.020	77.29	104.82	1562
160.000	12.042	.08305	15.6775	968.137	4681.1	5096.4	142.844	78.68	106.69	1502
170.000	11.879	.08418	14.5536	895.801	5751.3	6172.2	149.371	80.16	108.65	1445
180.000	11.717	.08535	13.5285	829.109	6841.2	7268.0	155.638	81.73	110.67	1389
190.000	11.553	.08656	12.5896	767.292	7951.9	8384.7	161.677	83.37	112.77	1336
200.000	11.388	.08781	11.7262	709.738	9084.3	9523.3	167.517	85.07	114.95	1284
210.000	11.223	.08911	10.9293	655.925	10239.1	10684.6	173.179	86.83	117.20	1234
220.000	11.055	.09046	10.1912	605.422	11417.2	11869.5	178.685	88.64	119.52	1185
230.000	10.886	.09186	9.5054	557.866	12619.6	13078.9	184.050	90.49	121.92	1137
240.000	10.714	.09333	8.8660	512.957	13847.0	14313.7	189.292	92.37	124.41	1090
250.000	10.540	.09488	8.2682	470.444	15100.3	15574.7	194.422	94.28	126.98	1044
260.000	10.363	.09650	7.7075	430.118	16380.4	16862.9	199.454	96.20	129.64	998
270.000	10.181	.09822	7.1799	391.807	17688.1	18179.2	204.398	98.15	132.42	953
280.000	9.996	.10004	6.6821	355.371	19024.7	19524.7	209.266	100.10	135.31	909
290.000	9.805	.10199	6.2107	320.692	20390.6	20900.5	214.066	102.06	138.34	864
300.000	9.608	.10408	5.7630	287.681	21787.6	22308.0	218.810	104.02	141.54	820
310.000	9.404	.10634	5.3363	256.261	23217.0	23748.7	223.505	105.98	144.94	776
320.000	9.191	.10880	4.9281	226.373	24680.4	25224.5	228.164	107.94	148.58	732
330.000	8.968	.11151	4.5358	197.965	26180.2	26737.7	232.796	109.91	152.55	687
340.000	8.732	.11452	4.1571	170.995	27719.1	28291.7	237.414	111.87	156.94	642
350.000	8.480	.11792	3.7890	145.427	29300.9	29890.5	242.033	113.85	161.90	596
360.000	8.209	.12181	3.4285	121.231	30931.2	31540.3	246.672	115.87	167.66	549
370.000	7.913	.12638	3.0715	98.387	32618.3	33250.2	251.358	118.00	174.67	500
380.000	7.581	.13190	2.7124	76.892	34375.6	35035.1	256.128	120.41	183.66	449
390.000	7.201	.13888	2.3432	56.784	36227.1	36921.5	261.044	123.28	196.01	394
400.000	6.743	.14829	1.9524	38.210	38220.2	38961.6	266.208	126.61	214.35	333
410.000	6.148	.16264	1.5230	21.618	39850.8	40664.0	270.338	136.75	253.12	262
420.000	5.234	.19107	1.0400	8.552	42546.3	43501.6	277.172	136.58	330.49	188
430.000	3.749	.26671	.6099	4.442	46045.9	47379.5	286.294	138.56	394.74	147
440.000	2.820	.35464	.4207	7.175	48920.8	50694.0	293.920	138.44	274.96	156
450.000	2.391	.41829	.3365	10.555	51053.1	53144.5	299.430	138.95	223.38	170
460.000	2.132	.46899	.2868	13.568	52909.9	55254.8	304.069	140.00	201.35	183
470.000	1.951	.51246	.2530	16.266	54643.2	57205.5	308.265	141.37	189.94	193
480.000	1.814	.55128	.2280	18.725	56312.9	59069.4	312.189	142.91	183.41	203
490.000	1.704	.58682	.2085	20.995	57946.2	60882.3	315.928	144.57	179.53	211
500.000	1.613	.61991	.1928	23.116	59565.4	62664.9	319.530	146.30	177.22	219
520.000	1.469	.68073	.1689	27.005	62782.0	66185.7	326.434	149.89	175.34	233
540.000	1.358	.73645	.1512	30.538	66009.0	69691.3	333.050	153.55	175.48	245
560.000	1.268	.78853	.1376	33.804	69269.0	73211.7	339.451	157.21	176.71	255
580.000	1.193	.83791	.1266	36.863	72574.0	76763.5	345.683	160.84	178.56	265
600.000	1.130	.88518	.1177	39.756	75930.5	80356.5	351.773	164.43	180.80	274
620.000	1.074	.93078	.1101	42.513	79342.7	83996.6	357.741	167.94	183.26	282
640.000	1.026	.97502	.1036	45.158	82812.4	87687.5	363.600	171.39	185.86	290
660.000	.982	1.01813	.0981	47.709	86340.7	91431.4	369.360	174.75	188.54	297
680.000	.943	1.06029	.0932	50.179	89927.8	95229.3	375.029	178.04	191.26	304
700.000	.908	1.10165	.0888	52.581	93573.1	99081.4	380.612	181.24	193.98	311

138

Table 22. Continued

I-BUTANE ISCBAR AT P = 52 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CO BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
115.702	12.758	.07838	22.3519	1388.444	153.5	561.1	109.596	73.42	99.00	1794
120.000	12.689	.07881	21.5478	1338.502	578.4	988.2	113.219	73.82	99.67	1763
130.000	12.528	.07982	19.8320	1231.564	1578.0	1993.1	121.261	74.85	101.30	1693
140.000	12.367	.08086	18.3030	1135.664	2593.9	3014.4	128.830	76.01	103.01	1627
150.000	12.205	.08193	16.9311	1048.974	3626.8	4052.8	135.998	77.29	104.81	1564
160.000	12.044	.08303	15.6925	970.024	4677.6	5109.4	142.822	78.68	106.68	1504
170.000	11.882	.08416	14.5682	897.657	5747.4	6185.1	149.343	80.16	108.63	1446
180.000	11.719	.08533	13.5430	830.941	6837.0	7280.8	155.614	81.73	110.66	1391
190.000	11.556	.08654	12.6038	769.106	7947.4	8397.4	161.653	83.37	112.76	1337
200.000	11.391	.08779	11.7403	711.539	9079.3	9535.8	167.491	85.07	114.93	1285
210.000	11.226	.08908	10.9432	657.717	10233.7	10696.9	173.153	86.83	117.18	1235
220.000	11.058	.09043	10.2051	607.208	11411.3	11881.6	178.657	88.64	119.50	1186
230.000	10.889	.09183	9.5192	559.652	12613.2	13090.7	184.022	90.49	121.89	1138
240.000	10.718	.09330	8.8799	514.745	13840.0	14325.1	189.262	92.37	124.37	1091
250.000	10.544	.09484	8.2821	472.238	15092.6	15585.8	194.390	94.28	126.94	1045
260.300	10.367	.09646	7.7215	431.922	16371.9	16873.5	199.420	96.20	129.60	1000
270.000	10.186	.09817	7.1941	393.623	17678.8	18189.3	204.363	98.15	132.36	955
280.000	10.001	.09999	6.6965	357.202	19014.3	19534.2	209.228	100.10	135.24	911
290.000	9.811	.10192	6.2254	322.541	20379.2	20909.3	214.026	102.06	138.26	867
300.000	9.615	.10400	5.7781	289.551	21775.0	22315.8	218.766	104.02	141.44	823
310.000	9.412	.10625	5.3519	258.157	23202.9	23755.4	223.458	105.98	144.81	779
320.000	9.200	.10870	4.9442	228.297	24664.5	25229.8	228.112	107.94	148.43	734
330.000	8.978	.11138	4.5527	199.922	26162.1	26741.3	232.739	109.91	152.35	690
340.000	8.744	.11437	4.1749	172.991	27698.3	28293.0	237.350	111.87	156.68	645
350.000	8.494	.11773	3.8081	147.471	29276.7	29888.9	241.961	113.85	161.56	600
360.000	8.226	.12157	3.4493	123.335	30902.5	31534.6	246.589	115.87	167.19	553
370.000	7.933	.12606	3.0946	100.568	32583.4	33238.9	251.259	118.00	173.99	505
380.000	7.607	.13146	2.7389	79.174	34331.9	35015.4	256.007	120.40	182.62	454
390.000	7.235	.13821	2.3752	59.206	36169.6	36888.3	260.898	123.27	194.26	400
400.000	6.794	.14719	1.9935	40.818	38138.6	38904.0	265.990	126.58	210.95	342
410.000	6.235	.16038	1.5813	24.438	39718.1	40552.0	269.986	136.66	244.56	274
420.000	5.437	.18393	1.1309	11.282	42257.9	43214.4	276.399	136.23	297.32	205
430.000	4.172	.23972	.7064	5.137	45422.8	46669.6	284.525	138.48	378.50	155
440.000	3.112	.32131	.4774	6.562	48433.8	50104.6	292.427	139.01	296.76	155
450.000	2.588	.38647	.3729	9.790	50708.3	52717.9	298.303	139.46	234.92	168
460.000	2.284	.43787	.3138	12.839	52639.2	54916.1	303.135	140.43	208.06	180
470.000	2.077	.48147	.2745	15.593	54417.6	56921.3	307.449	141.73	194.37	191
480.000	1.923	.52013	.2459	18.105	56117.9	58822.6	311.452	143.22	186.60	201
490.000	1.801	.55534	.2240	20.424	57775.5	60663.2	315.248	144.84	181.95	210
500.000	1.701	.58800	.2064	22.588	59409.9	62467.5	318.893	146.54	179.15	217
520.000	1.544	.64779	.1798	26.551	62651.7	66020.2	325.960	150.08	176.66	231
540.000	1.424	.70235	.1605	30.146	65896.2	69548.5	332.519	153.70	176.45	244
560.000	1.323	.75321	.1456	33.464	69169.3	73086.0	338.951	157.34	177.46	254
580.000	1.248	.80133	.1337	36.568	72484.5	76651.4	345.207	160.95	179.17	264
600.000	1.180	.84733	.1240	39.500	75849.3	80255.4	351.316	164.52	181.30	273
620.000	1.122	.89164	.1159	42.292	79268.2	83904.7	357.299	168.02	183.68	282
640.000	1.070	.93458	.1090	44.968	82743.6	87603.4	363.170	171.45	186.22	289
660.000	1.024	.97639	.1030	47.546	86276.8	91354.0	368.941	174.81	188.85	297
680.000	.983	1.01724	.0978	50.042	89868.0	95157.7	374.619	178.09	191.53	304
700.000	.946	1.05730	.0931	52.466	93517.2	99015.2	380.209	181.28	194.22	310

139

Table 22. Continued

I-BUTANE ISOBAR AT P = 55 BAR

T	DEN	VOL	DP/DT	DP/CD	E	H	S	CV	CP	W
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
115.820	12.758	.07838	22.3548	1390.231	161.8	592.9	109.668	73.43	99.00	1795
120.000	12.691	.07880	21.5730	1341.647	574.9	1008.3	113.189	73.82	99.66	1765
130.000	12.530	.07981	19.8564	1234.603	1574.1	2013.1	121.230	74.85	101.29	1695
140.000	12.369	.08085	18.3266	1138.620	2589.5	3034.2	128.799	76.01	103.00	1629
150.000	12.208	.08191	16.9540	1051.860	3622.0	4072.5	135.966	77.29	104.80	1566
160.000	12.047	.08301	15.7149	972.854	4672.4	5129.0	142.788	78.68	106.67	1506
170.000	11.885	.08414	14.5902	900.442	5741.7	6204.5	149.313	80.16	108.62	1448
180.000	11.723	.08530	13.5646	833.689	6830.8	7300.0	155.578	81.73	110.64	1393
190.000	11.560	.08651	12.6251	771.826	7940.5	8416.3	161.616	83.37	112.73	1340
200.000	11.395	.08775	11.7614	714.238	9071.8	9554.5	167.453	85.07	114.90	1288
210.000	11.230	.08905	10.9642	660.403	10225.5	10715.3	173.113	86.83	117.14	1238
220.000	11.063	.09039	10.2259	609.886	11402.5	11899.6	178.616	88.64	119.46	1189
230.000	10.895	.09179	9.5400	562.328	12603.5	13108.4	183.979	90.49	121.85	1141
240.000	10.724	.09325	8.9007	517.425	13829.6	14342.3	189.217	92.37	124.32	1094
250.000	10.551	.09478	8.3030	474.926	15081.1	15602.4	194.343	94.28	126.88	1048
260.000	10.374	.09639	7.7425	434.623	16359.3	16889.5	199.371	96.20	129.52	1003
270.000	10.194	.09810	7.2154	396.342	17665.0	18204.5	204.310	98.15	132.27	958
280.000	10.010	.09990	6.7181	359.943	18999.0	19548.5	209.172	100.10	135.14	914
290.000	9.820	.10183	6.2474	325.309	20362.4	20922.4	213.966	102.06	138.14	870
300.000	9.625	.10389	5.8007	292.350	21756.2	22327.6	218.702	104.02	141.29	826
310.000	9.423	.10612	5.3751	260.992	23181.9	23765.6	223.389	105.98	144.63	782
320.000	9.213	.10854	4.9683	231.173	24640.9	25237.9	228.036	107.95	148.20	738
330.000	8.993	.11120	4.5779	202.846	26135.3	26746.9	232.655	109.91	152.07	694
340.000	8.761	.11414	4.2014	175.972	27667.5	28295.3	237.256	111.87	156.31	650
350.000	8.514	.11745	3.8364	150.520	29240.9	29886.9	241.854	113.85	161.06	605
360.000	8.250	.12122	3.4800	126.468	30860.2	31526.9	246.466	115.87	166.52	559
370.000	7.962	.12560	3.1285	103.807	32532.4	33223.1	251.114	118.00	173.03	511
380.000	7.644	.13082	2.7776	82.552	34268.4	34987.9	255.831	120.40	181.18	462
390.000	7.284	.13728	2.4213	62.768	36087.3	36842.3	260.664	123.26	191.91	410
400.000	6.864	.14568	2.0516	44.619	38024.8	38826.0	265.685	126.55	206.63	354
410.000	6.349	.15751	1.6601	28.495	39542.9	40409.2	269.521	136.57	234.94	290
420.000	5.664	.17655	1.2450	15.310	41929.7	42900.8	275.524	135.89	268.43	228
430.000	4.669	.21418	.8437	7.238	44713.7	45891.7	282.559	138.01	332.01	173
440.000	3.581	.27925	.5727	6.416	47692.0	49228.0	290.230	139.52	314.93	157
450.000	2.910	.34362	.4344	8.880	50161.8	52051.7	296.579	140.14	253.06	166
460.000	2.527	.39572	.3582	11.868	52214.9	54391.4	301.723	141.03	218.93	178
470.000	2.275	.43948	.3094	14.668	54067.3	56484.5	306.225	142.25	201.48	189
480.000	2.092	.47791	.2747	17.244	55817.2	58445.7	310.355	143.67	191.66	198
490.000	1.951	.51267	.2485	19.626	57510.6	60330.3	314.241	145.23	185.77	207
500.000	1.836	.54474	.2279	21.848	59172.4	62168.5	317.955	146.89	182.15	215
520.000	1.658	.60311	.1970	25.915	62453.3	65770.4	325.019	150.36	178.69	230
540.000	1.524	.65607	.1749	29.597	65725.3	69333.6	331.744	153.93	177.95	242
560.000	1.418	.70525	.1580	32.989	69018.5	72897.4	338.224	157.53	178.62	253
580.000	1.330	.75163	.1447	36.157	72349.4	76483.4	344.516	161.11	180.09	263
600.000	1.256	.79587	.1339	39.145	75726.7	80104.0	350.653	164.65	182.05	272
620.000	1.193	.83841	.1248	41.987	79156.1	83767.4	356.659	168.14	184.32	281
640.000	1.137	.87957	.1172	44.707	82640.2	87477.8	362.549	171.55	186.76	289
660.000	1.087	.91960	.1106	47.326	86180.6	91238.4	368.335	174.90	189.32	296
680.000	1.043	.95867	.1048	49.858	89778.2	95050.9	374.025	178.16	191.94	303
700.000	1.003	.99694	.0998	52.316	93432.7	98915.8	379.627	181.35	194.58	310

140

Table 22.   Continued

I-BUTANE ISOBAR AT P =   60 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
116.016	12.759	.07838	22.3600	1393.222	175.4	645.7	109.785	73.44	99.02	1797
120.000	12.695	.07877	21.6150	1346.887	569.0	1041.7	113.139	73.82	99.65	1768
130.000	12.534	.07978	19.8968	1239.669	1567.6	2046.3	121.179	74.85	101.27	1698
140.000	12.374	.08082	18.3659	1143.546	2582.4	3067.3	128.746	76.01	102.98	1632
150.000	12.213	.08188	16.9922	1056.670	3614.1	4105.4	135.912	77.29	104.77	1569
160.000	12.052	.08297	15.7522	977.569	4663.7	5161.6	142.733	78.68	106.64	1509
170.000	11.891	.08410	14.6268	905.080	5732.2	6236.8	149.256	80.16	108.59	1452
180.000	11.729	.08526	13.6005	838.266	6820.4	7332.0	155.519	81.73	110.60	1397
190.000	11.566	.08646	12.6606	776.356	7929.2	8448.0	161.555	83.37	112.69	1343
200.000	11.402	.08770	11.7964	718.733	9059.5	9585.7	167.390	85.07	114.86	1292
210.000	11.238	.08899	10.9989	664.874	10212.1	10746.0	173.048	86.83	117.09	1241
220.000	11.071	.09032	10.2605	614.344	11387.8	11929.8	178.548	88.64	119.40	1193
230.000	10.904	.09171	9.5745	566.781	12587.6	13137.8	183.907	90.49	121.78	1145
240.000	10.734	.09317	8.9352	521.883	13812.1	14371.0	189.142	92.37	124.24	1098
250.000	10.561	.09469	8.3376	479.398	15062.1	15630.2	194.265	94.28	126.78	1053
260.000	10.386	.09629	7.7774	439.115	16338.5	16916.3	199.288	96.20	129.41	1008
270.000	10.207	.09798	7.2506	400.862	17642.1	18230.0	204.223	98.15	132.14	963
280.000	10.024	.09977	6.7538	364.499	18973.8	19572.4	209.079	100.10	134.97	919
290.000	9.836	.10167	6.2839	329.910	20334.6	20944.6	213.867	102.06	137.94	875
300.000	9.642	.10371	5.8379	296.998	21725.4	22347.6	218.595	104.02	141.05	832
310.000	9.442	.10591	5.4135	265.696	23147.4	23782.9	223.273	105.98	144.34	789
320.000	9.234	.10829	5.0081	235.943	24602.2	25252.0	227.911	107.95	147.84	745
330.000	9.017	.11090	4.6193	207.692	26091.4	26756.8	232.517	109.91	151.61	702
340.000	8.789	.11378	4.2450	180.906	27617.3	28300.0	237.103	111.87	155.72	658
350.000	8.547	.11700	3.8828	155.558	29182.8	29884.9	241.681	113.86	160.29	613
360.000	8.288	.12065	3.5300	131.632	30792.0	31515.9	246.268	115.87	165.48	568
370.000	8.009	.12486	3.1836	109.128	32450.6	33199.8	250.882	118.00	171.57	522
380.000	7.703	.12983	2.8398	88.074	34167.8	34946.8	255.551	120.40	179.04	474
390.000	7.361	.13586	2.4939	68.544	35959.3	36774.4	260.315	123.25	188.57	424
400.000	6.969	.14349	2.1405	50.707	37853.4	38714.3	265.225	126.52	200.93	372
410.000	6.507	.15368	1.7749	34.898	39295.5	40217.6	268.864	136.45	223.87	313
420.000	5.936	.16846	1.3988	21.744	41527.7	42538.4	274.456	135.56	242.81	258
430.000	5.198	.19239	1.0347	12.296	43966.1	45120.4	280.530	137.31	275.88	206
440.000	4.289	.23314	.7390	8.094	46642.2	48041.0	287.244	139.47	300.83	173
450.000	3.497	.28600	.5530	8.468	49224.1	50940.0	293.760	140.86	273.80	168
460.000	2.973	.33641	.4435	10.719	51469.3	53487.8	299.362	141.88	237.40	175
470.000	2.633	.37984	.3750	13.405	53456.0	55735.0	304.196	143.03	214.18	185
480.000	2.394	.41777	.3281	16.012	55296.7	57803.3	308.551	144.37	200.68	195
490.000	2.213	.45178	.2935	18.462	57055.2	59765.9	312.598	145.86	192.52	204
500.000	2.071	.48294	.2668	20.761	58766.0	61663.7	316.432	147.45	187.43	213
520.000	1.855	.53917	.2278	24.974	62116.7	65351.7	323.666	150.81	182.22	227
540.000	1.696	.58976	.2004	28.785	65436.4	68974.9	330.503	154.30	180.50	240
560.000	1.571	.63646	.1799	32.289	68764.6	72583.3	337.065	157.84	180.57	252
580.000	1.470	.68031	.1639	35.556	72122.3	76204.2	343.418	161.37	181.65	262
600.000	1.385	.72198	.1510	38.631	75521.3	79853.2	349.603	164.87	183.33	271
620.000	1.312	.76193	.1403	41.550	78968.0	83539.6	355.647	168.33	185.38	280
640.000	1.249	.80049	.1313	44.340	82466.9	87269.9	361.568	171.72	187.67	288
660.000	1.193	.83792	.1236	47.022	86019.8	91047.3	367.380	175.04	190.10	296
680.000	1.144	.87439	.1170	49.611	89628.1	94874.4	373.093	178.29	192.62	303
700.000	1.099	.91006	.1111	52.121	93292.0	98752.3	378.713	181.46	195.19	310

Table 22. Continued

I-BUTANE ISOBAR AT P = 65 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
116.210	12.759	.07838	22.3654	1396.232	188.9	698.4	109.901	73.46	99.04	1799
120.000	12.698	.07875	21.6570	1352.139	563.2	1075.1	113.089	73.82	99.63	1771
130.000	12.538	.07976	19.9373	1244.737	1561.2	2079.6	121.128	74.85	101.26	1702
140.000	12.378	.08079	18.4051	1148.471	2575.2	3100.3	128.694	76.01	102.96	1635
150.000	12.218	.08185	17.0304	1061.478	3606.2	4138.2	135.858	77.29	104.75	1573
160.000	12.057	.08294	15.7894	982.282	4655.1	5194.2	142.677	78.68	106.62	1513
170.000	11.896	.08406	14.6633	909.715	5722.7	6269.1	149.199	80.16	108.56	1455
180.000	11.735	.08522	13.6364	842.839	6810.1	7364.0	155.460	81.73	110.57	1400
190.000	11.572	.08641	12.6960	780.882	7918.0	8479.6	161.494	83.37	112.66	1347
200.000	11.409	.08765	11.8314	723.223	9047.2	9616.9	167.327	85.07	114.81	1295
210.000	11.245	.08893	11.0336	669.339	10198.7	10776.8	172.982	86.83	117.04	1245
220.000	11.080	.09026	10.2950	618.795	11373.3	11960.0	178.480	88.64	119.34	1197
230.000	10.912	.09164	9.6088	571.227	12571.7	13167.4	183.837	90.49	121.71	1149
240.000	10.743	.09308	8.9696	526.333	13794.8	14399.8	189.068	92.37	124.16	1103
250.000	10.571	.09460	8.3721	483.859	15043.3	15658.1	194.187	94.28	126.68	1057
260.000	10.397	.09618	7.8121	443.595	16317.9	16943.1	199.206	96.20	129.30	1012
270.000	10.219	.09786	7.2856	405.369	17619.6	18255.6	204.136	98.15	132.00	968
280.000	10.037	.09963	6.7893	369.039	18949.0	19596.6	208.988	100.10	134.81	924
290.000	9.851	.10151	6.3200	334.489	20307.1	20967.0	213.769	102.06	137.75	881
300.000	9.659	.10353	5.8749	301.625	21695.0	22367.9	218.490	104.02	140.82	838
310.000	9.461	.10570	5.4515	270.377	23113.6	23800.6	223.160	105.98	144.05	795
320.000	9.255	.10805	5.0473	240.685	24564.3	25266.6	227.787	107.95	147.49	752
330.000	9.041	.11061	4.6602	212.503	26048.6	26767.5	232.381	109.91	151.17	709
340.000	8.816	.11343	4.2879	185.797	27568.5	28305.8	236.952	111.87	155.16	665
350.000	8.579	.11657	3.9282	160.543	29126.6	29884.3	241.513	113.86	159.57	622
360.000	8.326	.12011	3.5788	136.729	30726.2	31507.0	246.076	115.87	164.52	577
370.000	8.054	.12417	3.2368	114.362	32372.5	33179.6	250.659	118.00	170.26	532
380.000	7.758	.12890	2.8992	93.475	34073.1	34911.0	255.286	120.40	177.17	486
390.000	7.431	.13458	2.5621	74.149	35840.9	36715.7	259.991	123.24	185.77	438
400.000	7.063	.14159	2.2217	56.546	37699.9	38620.2	264.812	126.49	196.49	388
410.000	6.639	.15062	1.8752	40.957	39086.0	40065.1	268.307	136.38	216.24	334
420.000	6.139	.16290	1.5252	27.846	41221.5	42280.4	273.644	135.37	228.47	284
430.000	5.534	.18071	1.1876	17.829	43482.7	44657.3	279.237	136.89	247.97	235
440.000	4.809	.20795	.8951	11.612	45900.4	47252.0	285.201	139.02	270.30	197
450.000	4.054	.24666	.6804	9.718	48386.0	49989.5	291.353	140.96	271.38	179
460.000	3.447	.29009	.5407	10.555	50716.4	52602.0	297.096	142.39	249.62	178
470.000	3.018	.33132	.4499	12.643	52823.0	54976.6	302.204	143.65	226.24	185
480.000	2.716	.36821	.3881	15.096	54757.9	57151.2	306.784	144.98	209.92	193
490.000	2.492	.40134	.3435	17.534	56586.0	59194.7	310.997	146.42	199.55	202
500.000	2.317	.43158	.3097	19.866	58349.1	61154.4	314.957	147.96	192.92	211
520.000	2.058	.48585	.2612	24.183	61773.8	64931.8	322.366	151.23	185.85	226
540.000	1.871	.53434	.2278	28.101	65143.3	68616.5	329.320	154.65	183.12	239
560.000	1.728	.57887	.2032	31.704	68508.0	72270.7	335.964	158.13	182.56	250
580.000	1.612	.62051	.1842	35.058	71893.5	75926.8	342.380	161.62	183.22	261
600.000	1.515	.65996	.1690	38.212	75314.5	79604.2	348.613	165.09	184.61	271
620.000	1.433	.69768	.1565	41.202	78779.3	83314.2	354.695	168.51	186.45	280
640.000	1.362	.73401	.1461	44.056	82292.9	87064.0	360.648	171.88	188.58	288
660.000	1.300	.76921	.1372	46.795	85858.4	90858.3	366.486	175.18	190.88	296
680.000	1.245	.80345	.1295	49.437	89477.6	94700.1	372.220	178.41	193.30	303
700.000	1.195	.83690	.1228	51.995	93150.9	98590.8	377.859	181.56	195.78	310

Table 22.   Continued

I-BUTANE ISOBAR AT P = 70 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
116.402	12.760	.07837	22.3711	1399.259	202.3	750.9	110.016	73.48	99.05	1801
120.000	12.702	.07873	21.6988	1357.371	557.4	1108.5	113.040	73.82	99.62	1775
130.000	12.542	.07973	19.9776	1249.802	1554.7	2112.8	121.077	74.85	101.24	1705
140.000	12.382	.08076	18.4442	1153.396	2568.1	3133.4	128.641	76.01	102.94	1639
150.000	12.222	.08182	17.0684	1066.285	3598.4	4171.1	135.804	77.29	104.73	1576
160.000	12.062	.08290	15.8266	986.993	4646.5	5226.8	142.622	78.68	106.59	1516
170.000	11.902	.08402	14.6997	914.347	5713.3	6301.5	149.142	80.16	108.53	1459
180.000	11.741	.08517	13.6722	847.409	6799.8	7396.0	155.402	81.73	110.54	1404
190.000	11.579	.08636	12.7312	785.403	7906.8	8511.3	161.434	83.37	112.62	1351
200.000	11.416	.08759	11.8662	727.708	9035.1	9648.2	167.264	85.07	114.77	1299
210.000	11.253	.08887	11.0681	673.799	10185.5	10807.6	172.917	86.83	116.99	1249
220.000	11.088	.09019	10.3293	623.239	11358.9	11990.2	178.412	88.64	119.28	1201
230.000	10.921	.09157	9.6431	575.665	12556.0	13197.0	183.766	90.49	121.64	1153
240.000	10.753	.09300	9.0038	530.773	13777.7	14428.7	188.994	92.37	124.08	1107
250.000	10.582	.09450	8.4064	488.310	15024.6	15686.1	194.110	94.28	126.59	1062
260.000	10.408	.09608	7.8466	448.064	16297.5	16970.1	199.125	96.20	129.19	1017
270.000	10.231	.09774	7.3205	409.863	17597.2	18281.4	204.051	98.15	131.87	973
280.000	10.051	.09950	6.8246	373.564	18924.5	19620.9	208.897	100.10	134.66	929
290.000	9.866	.10136	6.3559	339.052	20280.1	20989.6	213.672	102.06	137.56	886
300.000	9.675	.10335	5.9115	306.231	21665.0	22388.5	218.387	104.02	140.59	843
310.000	9.479	.10549	5.4891	275.033	23080.3	23818.7	223.048	105.99	143.78	801
320.000	9.276	.10781	5.0861	245.398	24527.0	25281.7	227.666	107.95	147.15	758
330.000	9.064	.11032	4.7005	217.281	26006.6	26778.9	232.248	109.91	150.75	716
340.000	8.843	.11309	4.3301	190.649	27520.9	28312.5	236.806	111.88	154.64	673
350.000	8.609	.11615	3.9728	165.481	29071.9	29885.0	241.349	113.86	158.90	630
360.000	8.362	.11959	3.6264	141.766	30662.8	31500.0	245.890	115.87	163.63	586
370.000	8.096	.12351	3.2884	119.517	32297.8	33162.4	250.445	118.00	169.07	542
380.000	7.810	.12805	2.9562	98.770	33983.3	34879.7	255.035	120.39	175.52	497
390.000	7.496	.13341	2.6267	79.608	35730.6	36664.5	259.688	123.23	183.39	451
400.000	7.147	.13992	2.2969	62.185	37560.3	38539.7	264.435	126.47	192.91	403
410.000	6.753	.14808	1.9651	46.753	38902.8	39939.4	267.818	136.33	210.59	352
420.000	6.302	.15869	1.6341	33.672	40970.6	42081.4	272.980	135.24	219.12	306
430.000	5.778	.17307	1.3158	23.347	43123.7	44335.2	278.282	136.62	232.14	261
440.000	5.174	.19327	1.0323	16.102	45379.3	46732.2	283.792	138.62	247.40	222
450.000	4.516	.22145	.8058	12.260	47717.7	49267.9	289.490	140.74	257.62	196
460.000	3.902	.25626	.6437	11.613	50027.7	51821.5	295.104	142.54	250.31	187
470.000	3.416	.29276	.5323	12.667	52197.0	54246.3	300.319	144.05	234.14	188
480.000	3.053	.32751	.4546	14.628	54212.4	56505.0	305.075	145.45	218.18	194
490.000	2.783	.35938	.3986	16.898	56108.6	58624.2	309.446	146.90	206.40	202
500.000	2.573	.38859	.3565	19.190	57925.9	60645.5	313.530	148.42	198.42	210
520.000	2.268	.44094	.2972	23.546	61426.5	64513.0	321.115	151.62	189.54	225
540.000	2.051	.48751	.2570	27.544	64847.6	68260.1	328.187	154.98	185.76	238
560.000	1.886	.53010	.2278	31.229	68249.7	71960.3	334.915	158.41	184.57	250
580.000	1.755	.56979	.2055	34.661	71663.6	75652.1	341.393	161.86	184.81	260
600.000	1.647	.60728	.1878	37.885	75107.1	79358.1	347.675	165.30	185.90	270
620.000	1.555	.64305	.1734	40.939	78590.0	83091.4	353.796	168.69	187.52	279
640.000	1.476	.67744	.1614	43.851	82118.9	86860.9	359.780	172.03	189.48	288
660.000	1.407	.71069	.1512	46.644	85697.1	90671.9	365.643	175.31	191.66	296
680.000	1.346	.74300	.1425	49.334	89327.2	94528.2	371.399	178.52	193.98	303
700.000	1.291	.77452	.1349	51.936	93009.9	98431.6	377.056	181.67	196.38	310

143

Table 22. Continued

I-BUTANE ISOBAR AT P = 75 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
116.593	12.760	.07837	22.3771	1402.304	215.5	803.3	110.129	73.50	99.07	1803
120.000	12.706	.07870	21.7407	1362.623	551.6	1141.9	112.990	73.82	99.60	1778
130.000	12.546	.07971	20.0179	1254.868	1548.3	2146.1	121.026	74.85	101.22	1708
140.000	12.387	.08073	18.4832	1158.319	2561.0	3166.5	128.589	76.01	102.92	1642
150.000	12.227	.08179	17.1064	1071.091	3590.6	4204.0	135.751	77.29	104.71	1579
160.000	12.067	.08287	15.8637	991.701	4637.9	5259.5	142.567	78.68	106.57	1520
170.000	11.907	.08398	14.7360	918.977	5704.0	6333.9	149.085	80.16	108.50	1462
180.000	11.746	.08513	13.7079	851.976	6789.6	7428.1	155.343	81.73	110.50	1407
190.000	11.585	.08632	12.7665	789.929	7895.6	8543.0	161.373	83.37	112.58	1354
200.000	11.423	.08754	11.9010	732.189	9022.9	9679.5	167.202	85.07	114.72	1303
210.000	11.260	.08881	11.1026	678.253	10172.3	10838.4	172.853	86.83	116.94	1253
220.000	11.096	.09013	10.3635	627.677	11344.5	12020.5	178.345	88.64	119.22	1205
230.000	10.930	.09149	9.6772	580.096	12540.4	13226.7	183.696	90.49	121.57	1157
240.000	10.762	.09292	9.0378	535.205	13760.7	14457.6	188.921	92.37	124.00	1111
250.000	10.592	.09441	8.4405	492.751	15006.1	15714.2	194.033	94.28	126.50	1066
260.000	10.419	.09598	7.8809	452.521	16277.3	16997.2	199.045	96.21	129.08	1022
270.000	10.243	.09762	7.3551	414.343	17575.1	18307.3	203.966	98.15	131.74	978
280.000	10.064	.09936	6.8596	378.073	18900.2	19645.5	208.807	100.10	134.51	934
290.000	9.880	.10121	6.3915	343.597	20253.4	21012.5	213.577	102.06	137.38	892
300.000	9.692	.10318	5.9479	310.818	21635.6	22409.4	218.284	104.02	140.38	849
310.000	9.497	.10529	5.5263	279.667	23047.5	23837.2	222.938	105.99	143.52	807
320.000	9.296	.10757	5.1245	250.085	24490.5	25297.3	227.546	107.95	146.83	765
330.000	9.087	.11005	4.7403	222.028	25965.6	26790.9	232.118	109.91	150.36	722
340.000	8.869	.11276	4.3716	195.464	27474.4	28320.1	236.662	111.88	154.14	680
350.000	8.639	.11575	4.0165	170.373	29018.9	29887.0	241.189	113.86	158.26	638
360.000	8.396	.11910	3.6729	146.747	30601.5	31494.8	245.710	115.87	162.81	595
370.000	8.137	.12289	3.3385	124.600	32226.1	33147.7	250.239	118.00	167.98	552
380.000	7.859	.12724	3.0111	103.971	33898.0	34852.4	254.795	120.39	174.04	508
390.000	7.557	.13234	2.6881	84.943	35627.2	36619.7	259.403	123.23	181.33	463
400.000	7.224	.13843	2.3671	67.658	37431.9	38470.1	264.087	126.46	189.94	418
410.000	6.854	.14590	2.0472	52.338	38739.2	39833.4	267.380	136.30	206.18	369
420.000	6.439	.15531	1.7309	39.272	40756.2	41921.0	272.410	135.16	212.44	325
430.000	5.971	.16749	1.4273	28.746	42835.2	44091.4	277.517	136.45	221.93	283
440.000	5.446	.18362	1.1527	20.909	44986.3	46363.5	282.740	138.33	232.61	245
450.000	4.875	.20512	.9233	15.830	47202.9	48741.3	288.084	140.44	242.41	216
460.000	4.302	.23244	.7468	13.604	49441.5	51184.8	293.454	142.45	244.34	200
470.000	3.798	.26327	.6186	13.626	51616.2	53590.7	298.629	144.20	235.68	195
480.000	3.395	.29459	.5260	14.799	53678.8	55888.2	303.467	145.76	223.65	197
490.000	3.081	.32454	.4581	16.660	55631.9	58066.0	307.958	147.27	212.29	203
500.000	2.837	.35247	.4071	18.783	57499.5	60143.0	312.154	148.80	203.59	210
520.000	2.483	.40281	.3357	23.074	61076.9	64098.0	319.912	151.98	193.19	224
540.000	2.234	.44757	.2881	27.113	64550.4	67907.2	327.101	155.29	188.41	237
560.000	2.048	.48839	.2539	30.862	67990.5	71653.4	333.913	158.68	186.57	249
580.000	1.900	.52633	.2279	34.359	71433.3	75380.8	340.453	162.09	186.38	260
600.000	1.779	.56208	.2075	37.646	74899.4	79115.0	346.783	165.49	187.18	270
620.000	1.678	.59612	.1910	40.758	78400.8	82871.7	352.942	168.86	188.58	279
640.000	1.590	.62879	.1773	43.723	81944.9	86660.8	358.957	172.18	190.38	288
660.000	1.514	.66034	.1658	46.564	85535.9	90488.4	364.846	175.44	192.43	296
680.000	1.447	.69095	.1559	49.299	89176.9	94359.0	370.623	178.64	194.65	304
700.000	1.387	.72078	.1473	51.942	92869.1	98274.9	376.299	181.77	196.97	311

144

Table 22. Continued

I-BUTANE ISOBAR AT P =   80 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MCL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
116.782	12.761	.07837	22.3834	1405.366	228.6	855.5	110.241	73.52	99.08	1805
120.000	12.709	.07868	21.7823	1367.856	545.9	1175.3	112.941	73.82	99.59	1781
130.000	12.550	.07968	20.0582	1259.935	1541.9	2179.4	120.976	74.85	101.21	1711
140.000	12.391	.08070	18.5222	1163.242	2553.9	3199.6	128.537	76.01	102.91	1646
150.000	12.232	.08176	17.1443	1075.895	3582.8	4236.8	135.697	77.29	104.68	1583
160.000	12.072	.08283	15.9007	996.408	4629.4	5292.1	142.512	78.68	106.54	1523
170.000	11.912	.08395	14.7723	923.605	5694.7	6366.3	149.029	80.17	108.47	1466
180.000	11.752	.08509	13.7435	856.539	6779.5	7460.2	155.285	81.73	110.47	1411
190.000	11.592	.08627	12.8016	794.442	7884.6	8574.7	161.313	83.37	112.54	1358
200.000	11.430	.08749	11.9357	736.664	9010.9	9710.8	167.140	85.08	114.68	1307
210.000	11.267	.08875	11.1369	682.701	10159.2	10869.3	172.788	86.84	116.89	1257
220.000	11.104	.09006	10.3976	632.108	11330.4	12050.8	178.278	88.64	119.16	1209
230.000	10.938	.09142	9.7111	584.519	12525.0	13256.4	183.627	90.49	121.51	1162
240.000	10.771	.09284	9.0718	539.628	13743.9	14486.6	188.849	92.37	123.92	1116
250.000	10.602	.09432	8.4745	497.182	14987.8	15742.4	193.957	94.28	126.41	1070
260.000	10.430	.09588	7.9151	456.967	16257.3	17024.3	198.965	96.21	128.97	1026
270.000	10.255	.09751	7.3895	418.811	17553.3	18333.3	203.882	98.15	131.62	982
280.000	10.077	.09923	6.8945	382.568	18876.3	19670.1	208.718	100.10	134.36	939
290.000	9.895	.10106	6.4268	348.125	20227.1	21035.6	213.482	102.06	137.21	897
300.000	9.708	.10301	5.9839	315.385	21606.5	22430.6	218.183	104.02	140.17	855
310.000	9.515	.10510	5.5632	284.279	23015.3	23856.1	222.829	105.99	143.27	813
320.000	9.316	.10734	5.1625	254.747	24454.6	25313.3	227.429	107.95	146.53	771
330.000	9.109	.10978	4.7796	226.746	25925.4	26803.6	231.990	109.91	149.98	729
340.000	8.894	.11244	4.4125	200.244	27429.0	28328.5	236.521	111.88	153.67	687
350.000	8.668	.11537	4.0595	175.222	28967.3	29890.2	241.033	113.86	157.67	646
360.000	8.430	.11863	3.7184	151.675	30542.2	31491.2	245.535	115.87	162.05	604
370.000	8.177	.12230	3.3873	129.618	32157.1	33135.5	250.040	118.00	166.99	561
380.000	7.906	.12649	3.0641	109.089	33816.7	34828.6	254.566	120.39	172.72	518
390.000	7.614	.13134	2.7468	90.170	35529.7	36580.4	259.133	123.23	179.52	475
400.000	7.295	.13708	2.4333	72.992	37312.8	38409.5	263.763	126.45	187.42	431
410.000	6.945	.14399	2.1231	57.750	38590.9	39742.8	266.982	136.27	202.62	384
420.000	6.558	.15248	1.8185	44.686	40567.6	41787.5	271.909	135.10	207.36	343
430.000	6.130	.16313	1.5266	34.007	42592.2	43897.2	276.873	136.32	214.74	303
440.000	5.661	.17665	1.2599	25.781	44670.7	46083.8	281.900	138.13	222.66	267
450.000	5.156	.19393	1.0311	19.936	46798.5	48350.0	286.993	140.18	230.44	237
460.000	4.637	.21565	.8468	16.475	48958.1	50683.3	292.121	142.26	235.36	216
470.000	4.146	.24121	.7057	15.307	51102.6	53032.3	297.173	144.18	233.14	206
480.000	3.724	.26855	.6004	15.707	53178.5	55326.9	302.004	145.91	225.35	204
490.000	3.380	.29589	.5213	16.950	55168.1	57535.2	306.558	147.52	216.29	206
500.000	3.104	.32215	.4610	18.728	57077.8	59655.0	310.841	149.09	207.96	211
520.000	2.701	.37027	.3767	22.791	60727.3	63689.5	318.755	152.28	196.67	225
540.000	2.420	.41326	.3209	26.813	64253.0	67559.0	326.058	155.57	191.00	237
560.000	2.210	.45243	.2812	30.600	67731.0	71350.5	332.952	158.93	188.55	249
580.000	2.046	.48877	.2514	34.150	71203.0	75113.1	339.554	162.31	187.95	260
600.000	1.912	.52295	.2281	37.490	74691.9	78875.5	345.932	165.68	188.45	270
620.000	1.800	.55544	.2093	40.654	78211.7	82655.3	352.129	169.03	189.64	280
640.000	1.705	.58658	.1938	43.667	81771.0	86463.7	358.175	172.32	191.27	288
660.000	1.622	.61660	.1808	46.552	85375.1	90307.9	364.089	175.57	193.19	296
680.000	1.549	.64571	.1697	49.328	89027.1	94192.7	369.888	178.75	195.31	304
700.000	1.484	.67404	.1602	52.010	92728.7	98121.0	375.581	181.86	197.55	311

145

Table 22. Continued

I-BUTANE ISOBAR AT P =   90 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
117.155	12.762	.07836	22.3966	1411.538	254.3	959.5	110.460	73.55	99.11	1809
120.000	12.717	.07864	21.8656	1378.344	534.5	1242.2	112.843	73.82	99.56	1788
130.000	12.558	.07963	20.1385	1270.068	1529.2	2245.9	120.875	74.85	101.17	1718
140.000	12.400	.08065	18.6000	1173.086	2539.9	3265.8	128.434	76.01	102.87	1652
150.000	12.241	.08169	17.2199	1085.500	3567.4	4302.6	135.591	77.30	104.64	1590
160.000	12.082	.08277	15.9745	1005.816	4612.5	5357.4	142.403	78.68	106.49	1530
170.000	11.923	.08387	14.8445	932.852	5676.2	6431.1	148.917	80.17	108.41	1473
180.000	11.764	.08501	13.8145	865.657	6759.3	7524.4	155.169	81.73	110.41	1418
190.000	11.604	.08618	12.8714	803.457	7862.7	8638.3	161.194	83.37	112.47	1365
200.000	11.443	.08739	12.0047	745.602	8987.1	9773.6	167.016	85.08	114.60	1314
210.000	11.282	.08864	11.2053	691.582	10133.4	10931.1	172.660	86.84	116.79	1265
220.000	11.119	.08993	10.4655	640.952	11302.2	12111.6	178.145	88.64	119.05	1216
230.000	10.955	.09128	9.7787	593.343	12494.4	13316.0	183.488	90.49	121.38	1170
240.000	10.790	.09268	9.1392	548.450	13710.7	14544.8	188.705	92.37	123.77	1124
250.000	10.622	.09415	8.5421	506.016	14951.6	15798.9	193.807	94.28	126.23	1079
260.000	10.452	.09568	7.9829	465.827	16217.9	17079.0	198.807	96.21	128.77	1035
270.000	10.279	.09729	7.4578	427.709	17510.2	18385.8	203.715	98.15	131.38	992
280.000	10.103	.09898	6.9635	391.516	18829.2	19720.0	208.542	100.10	134.08	949
290.000	9.923	.10077	6.4968	357.134	20175.4	21082.4	213.295	102.06	136.87	907
300.000	9.739	.10268	6.0552	324.467	21549.6	22473.7	217.984	104.03	139.77	866
310.000	9.550	.10472	5.6360	293.439	22952.4	23894.9	222.616	105.99	142.79	824
320.000	9.354	.10690	5.2372	263.997	24384.7	25346.8	227.198	107.95	145.95	783
330.000	9.153	.10926	4.8567	236.095	25847.4	26830.7	231.740	109.91	149.27	742
340.000	8.943	.11182	4.4927	209.703	27341.4	28347.8	236.248	111.88	152.80	701
350.000	8.724	.11463	4.1432	184.803	28868.0	29899.7	240.731	113.86	156.59	661
360.000	8.494	.11773	3.8067	161.390	30428.9	31488.5	245.199	115.88	160.68	620
370.000	8.251	.12120	3.4813	139.478	32026.4	33117.2	249.662	118.00	165.23	579
380.000	7.994	.12510	3.1654	119.107	33664.3	34790.2	254.134	120.40	170.42	538
390.000	7.719	.12956	2.8574	100.349	35349.5	36515.5	258.632	123.22	176.48	497
400.000	7.423	.13471	2.5560	83.315	37097.0	38309.4	263.173	126.44	183.36	455
410.000	7.104	.14076	2.2609	68.162	38328.5	39595.4	266.276	136.24	197.16	411
420.000	6.759	.14795	1.9737	55.063	40245.2	41576.7	271.050	135.02	200.06	374
430.000	6.387	.15656	1.6993	44.147	42193.1	43602.2	275.816	136.17	205.11	338
440.000	5.990	.16693	1.4455	35.409	44176.5	45679.0	280.590	137.86	210.22	304
450.000	5.573	.17944	1.2208	28.685	46190.7	47805.6	285.369	139.81	215.09	275
460.000	5.142	.19446	1.0304	23.787	48229.1	49979.3	290.147	141.86	219.51	251
470.000	4.712	.21221	.8746	20.660	50280.4	52190.3	294.902	143.91	222.28	234
480.000	4.304	.23235	.7503	19.255	52321.9	54413.1	299.582	145.87	221.63	224
490.000	3.939	.25390	.6526	19.222	54326.5	56611.6	304.115	147.69	217.68	220
500.000	3.625	.27585	.5756	19.998	56279.9	58762.5	308.461	149.42	212.46	221
520.000	3.140	.31850	.4651	22.954	60041.1	62907.6	316.591	152.74	202.45	228
540.000	2.795	.35783	.3916	26.661	63663.3	66883.8	324.095	156.04	195.81	239
560.000	2.539	.39393	.3398	30.406	67215.7	70761.0	331.146	159.36	192.35	251
580.000	2.340	.42741	.3013	34.002	70745.0	74591.6	337.867	162.70	190.99	262
600.000	2.179	.45884	.2716	37.417	74279.3	78408.9	344.338	166.03	190.92	272
620.000	2.046	.48865	.2479	40.663	77836.1	82233.9	350.609	169.33	191.69	281
640.000	1.934	.51715	.2285	43.758	81425.8	86080.2	356.715	172.59	193.01	290
660.000	1.836	.54457	.2123	46.721	85055.4	89956.6	362.679	175.81	194.69	298
680.000	1.751	.57110	.1986	49.569	88729.1	93869.0	368.519	178.96	196.61	306
700.000	1.675	.59688	.1868	52.319	92449.8	97821.7	374.248	182.05	198.68	313

146

Table 22. Continued

I-BUTANE ISOBAR AT P = 100 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
117.523	12.763	.07835	22.4108	1417.774	279.4	1062.9	110.673	73.59	99.14	1812
120.000	12.724	.07859	21.9487	1388.834	523.1	1309.1	112.745	73.82	99.53	1794
130.000	12.566	.07958	20.2185	1280.201	1516.7	2312.5	120.774	74.85	101.14	1725
140.000	12.408	.08059	18.6775	1182.928	2526.1	3332.0	128.331	76.01	102.83	1659
150.000	12.250	.08163	17.2953	1095.100	3552.2	4368.5	135.486	77.30	104.60	1596
160.000	12.092	.08270	16.0480	1015.217	4595.8	5422.8	142.295	78.68	106.44	1537
170.000	11.934	.08379	14.9165	942.090	5658.0	6495.9	148.805	8 (.17	108.36	1480
180.000	11.775	.08492	13.8851	874.763	6739.4	7588.7	155.055	81.73	110.34	1425
190.000	11.616	.08609	12.9410	812.457	7841.0	8701.9	161.075	83.37	112.40	1372
200.000	11.457	.08728	12.0734	754.522	8963.6	9836.4	166.894	85.08	114.51	1321
210.000	11.296	.08852	11.2733	700.442	10107.8	10993.1	172.534	86.84	116.70	1272
220.000	11.135	.08981	10.5329	649.771	11274.5	12172.6	178.014	88.65	118.94	1224
230.000	10.972	.09114	9.8458	602.140	12464.3	13375.8	183.352	90.49	121.25	1178
240.000	10.808	.09253	9.2062	557.239	13678.0	14603.3	188.562	92.37	123.62	1132
250.000	10.641	.09397	8.6090	514.812	14916.1	15855.8	193.658	94.28	126.06	1088
260.000	10.473	.09548	8.0500	474.645	16179.3	17134.1	198.651	96.21	128.57	1044
270.000	10.302	.09707	7.5253	436.559	17468.1	18438.8	203.552	98.15	131.15	1001
280.000	10.123	.09873	7.0316	400.411	18783.2	19770.5	208.369	100.11	133.81	959
290.000	9.951	.10049	6.5658	366.081	20125.0	21130.0	213.112	102.07	136.55	917
300.000	9.769	.10236	6.1253	333.477	21494.2	22517.9	217.789	104.03	139.39	876
310.000	9.583	.10435	5.7076	302.520	22891.4	23934.9	222.408	105.99	142.34	836
320.000	9.392	.10648	5.3105	273.156	24317.2	25382.0	226.975	107.95	145.41	795
330.000	9.194	.10877	4.9321	245.340	25772.3	26860.0	231.498	109.92	148.63	755
340.000	8.989	.11124	4.5707	219.041	27257.5	28369.9	235.985	111.88	152.01	715
350.000	8.776	.11394	4.2244	194.240	28773.6	29913.1	240.443	113.87	155.61	675
360.000	8.554	.11691	3.8917	170.934	30322.0	31491.1	244.880	115.88	159.47	636
370.000	8.320	.12019	3.5711	149.134	31904.3	33106.2	249.306	118.01	163.71	596
380.000	8.074	.12385	3.2612	128.876	33523.5	34762.0	253.732	120.40	168.50	557
390.000	7.814	.12798	2.9606	110.223	35185.8	36465.6	258.174	123.22	174.02	517
400.000	7.537	.13269	2.6684	93.271	36904.5	38231.4	262.644	126.43	180.20	478
410.000	7.241	.13810	2.3845	78.144	38100.5	39481.5	265.658	136.22	193.11	436
420.000	6.926	.14438	2.1099	64.976	39973.6	41417.2	270.323	134.98	194.96	401
430.000	6.592	.15170	1.8480	53.855	41868.9	43385.9	274.955	136.08	198.83	367
440.000	6.241	.16023	1.6040	44.756	43791.2	45393.6	279.570	137.71	202.65	336
450.000	5.877	.17016	1.3841	37.510	45736.1	47437.7	284.164	139.58	206.13	308
460.000	5.505	.18166	1.1924	31.868	47698.4	49515.0	288.730	141.58	209.31	284
470.000	5.131	.19491	1.0300	27.650	49673.6	51622.7	293.262	143.62	212.12	265
480.000	4.763	.20995	.8949	24.809	51654.6	53754.1	297.750	145.65	213.94	250
490.000	4.414	.22658	.7839	23.315	53629.3	55895.1	302.164	147.60	213.91	241
500.000	4.094	.24426	.6935	22.978	55582.9	58025.6	306.469	149.47	211.92	236
520.000	3.564	.28056	.5595	24.400	59395.5	62201.1	314.658	152.99	205.51	237
540.000	3.166	.31581	.4679	27.275	63091.3	66249.4	322.298	156.36	199.60	244
560.000	2.866	.34889	.4030	30.716	66710.2	70199.1	329.481	159.70	195.74	254
580.000	2.633	.37978	.3550	34.232	70294.0	74091.8	336.311	163.02	193.81	264
600.000	2.446	.40833	.3181	37.657	73872.4	77960.7	342.869	166.32	193.27	274
620.000	2.292	.43636	.2889	40.947	77465.1	81828.8	349.211	169.60	193.67	283
640.000	2.161	.46266	.2652	44.098	81084.7	85711.3	355.375	172.83	194.68	292
660.000	2.050	.48792	.2456	47.122	84739.7	89618.9	361.387	176.02	196.13	300
680.000	1.952	.51233	.2290	50.031	88434.8	93558.1	367.267	179.15	197.86	308
700.000	1.866	.53601	.2148	52.838	92174.1	97534.3	373.029	182.22	199.78	315

Table 22.   Continued

I-BUTANE ISOBAR AT P = 110 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
117.885	12.764	.07834	22.4260	1424.071	304.0	1165.7	110.881	73.62	99.17	1816
120.000	12.731	.07855	22.0315	1399.328	511.9	1376.0	112.647	73.82	99.50	1801
130.000	12.574	.07953	20.2983	1290.335	1504.2	2379.1	120.675	74.85	101.11	1731
140.000	12.416	.08054	18.7547	1192.767	2512.3	3398.2	128.229	76.02	102.79	1665
150.000	12.259	.08157	17.3704	1104.695	3537.0	4434.3	135.381	77.30	104.56	1603
160.000	12.102	.08263	16.1212	1024.611	4579.3	5488.2	142.187	78.69	106.40	1543
170.000	11.944	.08372	14.9881	951.319	5639.9	6560.9	148.694	80.17	108.31	1486
180.000	11.787	.08484	13.9554	883.857	6719.8	7653.0	154.940	81.73	110.28	1432
190.000	11.629	.08599	13.0102	821.443	7819.7	8765.6	160.958	83.37	112.33	1379
200.000	11.470	.08718	12.1416	763.425	8940.4	9899.4	166.773	85.08	114.43	1329
210.000	11.310	.08841	11.3408	709.282	10082.6	11055.2	172.408	86.84	116.61	1280
220.000	11.150	.08969	10.5999	658.568	11247.2	12233.7	177.884	88.65	118.84	1232
230.000	10.988	.09100	9.9124	610.909	12434.7	13435.8	183.217	90.49	121.13	1186
240.000	10.825	.09237	9.2727	565.998	13645.9	14662.0	188.422	92.38	123.49	1140
250.000	10.661	.09380	8.6754	523.574	14881.2	15913.0	193.511	94.28	125.90	1096
260.000	10.494	.09529	8.1165	483.422	16141.4	17189.6	198.497	96.21	128.38	1053
270.000	10.325	.09685	7.5922	445.364	17426.8	18492.2	203.390	98.15	130.93	1011
280.000	10.153	.09849	7.0990	409.253	18738.2	19821.6	208.199	100.11	133.56	969
290.000	9.978	.10022	6.6340	374.970	20075.8	21178.3	212.933	102.07	136.26	928
300.000	9.799	.10205	6.1944	342.421	21440.4	22562.9	217.599	104.03	139.04	887
310.000	9.616	.10400	5.7779	311.528	22832.2	23976.2	222.205	105.99	141.92	847
320.000	9.428	.10607	5.3824	282.230	24251.9	25418.7	226.757	107.96	144.91	807
330.000	9.234	.10829	5.0059	254.487	25700.0	26891.2	231.264	109.92	148.03	767
340.000	9.034	.11069	4.6467	228.266	27177.0	28394.6	235.731	111.89	151.29	728
350.000	8.827	.11329	4.3032	203.548	28683.6	29929.8	240.166	113.87	154.74	689
360.000	8.611	.11613	3.9739	180.327	30220.7	31498.1	244.576	115.88	158.40	651
370.000	8.385	.11925	3.6573	158.612	31789.5	33101.3	248.969	118.01	162.39	612
380.000	8.149	.12271	3.3523	138.435	33392.6	34742.4	253.356	120.40	166.85	574
390.000	7.901	.12657	3.0578	119.849	35035.2	36427.5	257.750	123.23	171.97	536
400.000	7.638	.13092	2.7729	102.935	36730.3	38170.4	262.162	126.43	177.64	498
410.000	7.362	.13584	2.4975	87.796	37897.8	39392.0	265.106	136.21	189.96	458
420.000	7.070	.14145	2.2324	74.536	39737.0	41292.9	269.686	134.95	191.14	426
430.000	6.763	.14786	1.9799	63.221	41593.4	43219.9	274.221	136.03	194.32	394
440.000	6.444	.15518	1.7437	53.824	43472.1	45179.1	278.725	137.61	197.47	364
450.000	6.116	.16349	1.5282	46.189	45369.5	47168.0	283.194	139.43	200.25	337
460.000	5.784	.17289	1.3369	40.070	47281.2	49193.0	287.623	141.38	202.71	314
470.000	5.450	.18347	1.1710	35.228	49203.4	51221.6	292.007	143.40	204.98	294
480.000	5.121	.19529	1.0296	31.523	51133.5	53281.7	296.344	145.42	206.99	277
490.000	4.799	.20836	.9102	28.927	53067.2	55359.2	300.628	147.42	208.36	265
500.000	4.494	.22254	.8101	27.419	54997.2	57445.1	304.842	149.37	208.64	256
520.000	3.954	.25289	.6564	27.112	58814.4	61596.2	312.983	153.07	205.92	250
540.000	3.524	.28378	.5482	28.875	62551.7	65673.3	320.677	156.56	201.82	253
560.000	3.188	.31372	.4700	31.669	66222.6	69673.5	327.952	159.94	198.40	259
580.000	2.923	.34215	.4120	34.905	69854.4	73618.0	334.873	163.27	196.29	268
600.000	2.710	.36904	.3674	38.231	73473.8	77533.2	341.510	166.57	195.43	277
620.000	2.534	.39457	.3323	41.505	77101.0	81441.3	347.917	169.83	195.51	286
640.000	2.387	.41897	.3039	44.678	80749.5	85358.2	354.135	173.05	196.27	295
660.000	2.260	.44239	.2805	47.739	84428.8	89295.2	360.192	176.21	197.50	303
680.000	2.151	.46501	.2608	50.693	88145.1	93260.2	366.111	179.33	199.06	311
700.000	2.054	.48693	.2440	53.546	91902.6	97258.8	371.906	182.38	200.84	318

148

Table 22. Continued

I-BUTANE ISOBAR AT P = 120 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MCL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
118.241	12.766	.07833	22.4420	1430.426	328.0	1268.0	111.084	73.65	99.20	1820
120.000	12.738	.07850	22.1141	1409.824	500.8	1442.9	112.551	73.82	99.47	1807
130.000	12.581	.07948	20.3778	1300.470	1491.9	2445.7	120.575	74.85	101.08	1738
140.000	12.425	.08048	18.8317	1202.604	2498.7	3464.5	128.127	76.02	102.76	1672
150.000	12.268	.08151	17.4452	1114.286	3522.1	4500.2	135.276	77.30	104.52	1610
160.000	12.112	.08257	16.1942	1033.999	4562.9	5553.7	142.080	78.69	106.35	1550
170.000	11.955	.08365	15.0595	960.539	5622.1	6625.8	148.584	80.17	108.25	1493
180.000	11.798	.08476	14.0254	892.940	6700.3	7717.4	154.827	81.74	110.22	1439
190.000	11.641	.08591	13.0791	830.415	7798.5	8829.4	160.841	83.38	112.26	1386
200.000	11.483	.08709	12.2096	772.311	8917.4	9962.4	166.652	85.08	114.36	1336
210.000	11.324	.08830	11.4080	718.103	10057.8	11117.4	172.284	86.84	116.52	1287
220.000	11.165	.08956	10.6665	667.341	11220.2	12295.0	177.755	88.65	118.74	1240
230.000	11.005	.09087	9.9786	619.653	12405.5	13496.0	183.033	90.50	121.01	1193
240.000	10.843	.09223	9.3385	574.727	13614.2	14720.9	188.283	92.38	123.35	1149
250.000	10.680	.09364	8.7412	532.302	14846.9	15970.5	193.366	94.28	125.75	1105
260.000	10.514	.09511	8.1824	492.161	16104.1	17245.4	198.346	96.21	128.21	1062
270.000	10.347	.09665	7.6584	454.125	17386.4	18546.1	203.232	98.16	130.73	1020
280.000	10.177	.09826	7.1656	418.047	18694.1	19873.3	208.032	100.11	133.31	978
290.000	10.004	.09996	6.7012	383.804	20027.8	21227.3	212.757	102.07	135.97	937
300.000	9.828	.10175	6.2625	351.302	21387.9	22608.9	217.412	104.03	138.71	897
310.000	9.647	.10365	5.8472	320.463	22774.7	24018.5	222.006	106.00	141.53	858
320.000	9.463	.10568	5.4530	291.224	24188.6	25456.8	226.546	107.96	144.45	818
330.000	9.273	.10784	5.0782	263.545	25630.1	26924.3	231.037	109.92	147.48	779
340.000	9.077	.11017	4.7210	237.390	27099.6	28421.6	235.486	111.89	150.64	741
350.000	8.875	.11268	4.3799	212.739	28597.4	29949.6	239.900	113.87	153.95	703
360.000	8.665	.11541	4.0535	189.585	30124.3	31509.2	244.285	115.89	157.44	665
370.000	8.447	.11839	3.7404	167.935	31681.1	33101.7	248.649	118.02	161.22	628
380.000	8.219	.12167	3.4396	147.813	33269.9	34729.9	253.002	120.41	165.43	591
390.000	7.981	.12530	3.1500	129.266	34895.7	36399.3	257.355	123.23	170.23	554
400.000	7.731	.12934	2.8710	112.362	36570.8	38122.9	261.718	126.43	175.52	518
410.000	7.470	.13387	2.6023	97.184	37714.8	39321.3	264.604	136.21	187.41	479
420.000	7.196	.13897	2.3446	83.817	39526.8	41194.4	269.118	134.94	188.13	448
430.000	6.911	.14470	2.0994	72.314	41352.6	43089.0	273.576	136.00	190.87	417
440.000	6.616	.15114	1.8694	62.648	43198.0	45011.7	277.996	137.56	193.63	389
450.000	6.315	.15835	1.6579	54.687	45060.2	46960.4	282.376	139.34	196.05	363
460.000	6.011	.16636	1.4676	48.202	46935.2	48931.6	286.708	141.25	198.14	341
470.000	5.707	.17522	1.2999	42.940	48819.8	50922.4	290.989	143.23	200.01	321
480.000	5.406	.18496	1.1544	38.706	50711.9	52931.4	295.219	145.24	201.78	304
490.000	5.112	.19563	1.0293	35.405	52609.8	54957.3	299.396	147.25	203.36	290
500.000	4.826	.20720	.9223	33.020	54510.9	56997.2	303.517	149.23	204.53	279
520.000	4.301	.23252	.7532	30.889	58304.1	61094.4	311.552	153.04	204.68	266
540.000	3.856	.25931	.6303	31.453	62056.5	65168.3	319.240	156.64	202.51	264
560.000	3.496	.28608	.5398	33.403	65760.7	69193.6	326.560	160.10	200.08	267
580.000	3.205	.31204	.4717	36.123	69430.8	73175.3	333.547	163.46	198.24	274
600.000	2.968	.33689	.4192	39.195	73086.5	77129.2	340.249	166.77	197.30	282
620.000	2.773	.36062	.3778	42.362	76745.4	81072.8	346.715	170.02	197.19	290
640.000	2.609	.38333	.3445	45.502	80421.3	85021.2	352.983	173.23	197.75	298
660.000	2.468	.40516	.3170	48.568	84124.1	88986.0	359.083	176.39	198.80	306
680.000	2.346	.42622	.2940	51.545	87860.8	92975.5	365.038	179.48	200.20	314
700.000	2.239	.44664	.2745	54.430	91635.9	96995.6	370.864	182.52	201.85	321

149

Table 22. Continued

I-BUTANE ISOBAR AT P = 130 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
118.592	12.767	.07833	22.4588	1436.838	351.6	1369.8	111.282	73.69	99.23	1824
120.000	12.745	.07846	22.1965	1420.324	489.8	1509.8	112.454	73.82	99.45	1814
130.000	12.589	.07943	20.4572	1310.606	1479.7	2512.3	120.477	74.85	101.05	1744
140.000	12.433	.08043	18.9084	1212.440	2485.2	3530.8	128.026	76.02	102.72	1678
150.000	12.277	.08145	17.5197	1123.874	3507.3	4566.1	135.173	77.30	104.48	1616
160.000	12.121	.08250	16.2668	1043.380	4546.7	5619.2	141.974	78.69	106.31	1557
170.000	11.965	.08358	15.1305	969.750	5604.4	6690.9	148.475	80.17	108.20	1500
180.000	11.809	.08468	14.0951	902.012	6681.1	7781.9	154.715	81.74	110.17	1446
190.000	11.653	.08582	13.1476	839.374	7777.6	8893.2	160.725	83.38	112.19	1393
200.000	11.496	.08699	12.2772	781.189	8894.7	10025.6	166.533	85.08	114.28	1343
210.000	11.338	.08820	11.4748	726.905	10033.2	11179.8	172.160	86.84	116.43	1294
220.000	11.180	.08945	10.7327	676.093	11193.6	12356.4	177.627	88.65	118.64	1247
230.000	11.021	.09074	10.0443	628.371	12376.7	13556.3	182.951	90.50	120.90	1201
240.000	10.860	.09208	9.4039	583.426	13583.1	14780.1	188.145	92.38	123.22	1157
250.000	10.698	.09347	8.8065	540.997	14813.2	16028.3	193.223	94.29	125.60	1113
260.000	10.535	.09493	8.2478	500.863	16067.6	17301.6	198.197	96.21	128.03	1070
270.000	10.369	.09644	7.7239	462.845	17346.7	18600.5	203.075	98.16	130.53	1029
280.000	10.201	.09803	7.2315	426.793	18651.0	19925.4	207.868	100.11	133.08	987
290.000	10.030	.09970	6.7677	392.586	19980.9	21277.0	212.584	102.07	135.70	947
300.000	9.856	.10146	6.3298	360.124	21336.7	22655.7	217.230	104.04	138.40	907
310.000	9.678	.10333	5.9154	329.332	22718.7	24061.9	221.813	106.00	141.16	868
320.000	9.496	.10530	5.5225	300.146	24127.2	25496.2	226.339	107.96	144.02	829
330.000	9.310	.10741	5.1491	272.518	25562.6	26959.0	230.816	109.93	146.97	791
340.000	9.118	.10967	4.7937	246.418	27025.0	28450.7	235.248	111.89	150.03	753
350.000	8.921	.11210	4.4547	221.823	28514.8	29972.1	239.643	113.88	153.23	716
360.000	8.716	.11473	4.1308	198.721	30032.3	31523.8	244.006	115.89	156.58	679
370.000	8.505	.11758	3.8207	177.119	31578.3	33106.9	248.344	118.02	160.18	643
380.000	8.285	.12070	3.5234	157.034	33154.5	34723.6	252.666	120.41	164.18	606
390.000	8.056	.12414	3.2380	138.506	34765.5	36379.2	256.984	123.23	168.73	571
400.000	7.817	.12793	2.9638	121.589	36423.4	38086.4	261.305	126.43	173.73	536
410.000	7.568	.13213	2.7006	106.356	37547.5	39265.2	264.143	136.20	185.29	498
420.000	7.309	.13681	2.4487	92.874	39336.9	41115.5	268.602	134.93	185.69	468
430.000	7.041	.14202	2.2094	81.185	41138.0	42984.0	272.999	135.98	188.13	439
440.000	6.766	.14780	1.9844	71.269	42956.7	44878.1	277.353	137.52	190.63	412
450.000	6.485	.15420	1.7763	63.012	44791.3	46795.8	281.663	139.28	192.85	387
460.000	6.203	.16121	1.5873	56.212	46638.2	48734.0	285.923	141.16	194.75	365
470.000	5.921	.16888	1.4186	50.623	48494.5	50689.9	290.129	143.12	196.40	345
480.000	5.643	.17721	1.2703	46.024	50358.0	52661.7	294.280	145.10	197.95	328
490.000	5.370	.18622	1.1410	42.268	52227.8	54648.7	298.377	147.10	199.44	313
500.000	5.104	.19593	1.0290	39.294	54103.0	56650.0	302.420	149.09	200.81	301
520.000	4.602	.21728	.8481	35.660	57861.2	60685.9	310.335	152.96	202.48	284
540.000	4.159	.24045	.7128	34.837	61609.6	64735.4	317.976	156.65	202.18	278
560.000	3.785	.26422	.6110	35.914	65331.0	68765.9	325.306	160.18	200.82	278
580.000	3.475	.28776	.5333	37.975	69028.1	72769.0	332.330	163.59	199.57	282
600.000	3.219	.31064	.4730	40.626	72713.3	76751.6	339.081	166.92	198.80	288
620.000	3.006	.33267	.4252	43.565	76400.2	80725.0	345.595	170.18	198.65	295
640.000	2.826	.35386	.3866	46.596	80101.3	84701.5	351.908	173.39	199.09	303
660.000	2.672	.37426	.3549	49.619	83826.3	88691.6	358.047	176.53	200.00	310
680.000	2.539	.39396	.3284	52.587	87582.3	92703.8	364.035	179.62	201.27	318
700.000	2.421	.41306	.3060	55.483	91374.4	96744.1	369.891	182.65	202.81	325

150

Table 22. Continued

I-BUTANE ISOBAR AT P = 140 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
118.938	12.769	.07832	22.4764	1443.3C4	374.7	1471.1	111.475	73.72	99.26	1828
120.000	12.752	.07842	22.2786	1430.827	478.8	1576.7	112.358	73.82	99.42	1820
130.C00	12.597	.07939	20.5362	1320.743	1467.5	2578.9	120.378	74.85	101.02	1751
140.000	12.441	.08038	18.9850	1222.286	2471.8	3597.1	127.925	76.02	102.69	1685
150.000	12.286	.08139	17.5940	1133.457	3492.6	4632.1	135.070	77.30	104.44	1623
160.000	12.131	.08243	16.3392	1052.755	4530.7	5684.8	141.868	78.69	106.26	1563
170.000	11.976	.08350	15.2013	978.953	5586.9	6755.9	148.366	80.17	108.15	1507
180.000	11.820	.08460	14.1645	911.073	6662.1	7846.5	154.603	81.74	110.11	1453
190.000	11.665	.08573	13.2158	848.320	7757.0	8957.2	160.610	83.38	112.13	1400
200.000	11.509	.08689	12.3444	790.042	8872.3	10088.8	166.414	85.08	114.21	1350
210.000	11.352	.08809	11.5412	735.688	10009.0	11242.2	172.038	86.84	116.35	1302
220.000	11.195	.08933	10.7985	684.823	11167.4	12418.0	177.501	88.65	118.54	1255
230.000	11.037	.09061	10.1096	637.065	12348.4	13616.9	182.820	90.50	120.79	1209
240.000	10.877	.09193	9.4689	592.099	13552.6	14839.5	188.009	92.38	123.10	1165
250.000	10.717	.09331	8.8713	549.660	14780.0	16086.4	193.082	94.29	125.46	1121
260.000	10.554	.09475	8.3125	509.530	16031.6	17358.1	198.049	96.22	127.87	1079
270.000	10.390	.09624	7.7888	471.525	17307.8	18655.2	202.921	98.16	130.34	1037
280.000	10.224	.09781	7.2967	435.495	18608.8	19978.1	207.707	100.11	132.86	997
290.000	10.055	.09945	6.8334	401.317	19935.0	21327.3	212.414	102.07	135.45	957
300.000	9.883	.10118	6.3961	368.891	21286.7	22703.2	217.050	104.04	138.10	917
310.000	9.708	.10301	5.9826	338.138	22664.2	24106.3	221.623	106.00	140.82	879
320.000	9.529	.10494	5.5908	308.996	24067.6	25536.8	226.138	107.97	143.61	840
330.000	9.346	.10700	5.2187	281.415	25497.2	26995.2	230.601	109.93	146.49	803
340.000	9.158	.10919	4.8649	255.359	26953.1	28481.8	235.018	111.90	149.47	766
350.000	8.965	.11155	4.5278	230.808	28435.4	29997.1	239.395	113.88	152.56	729
360.000	8.766	.11408	4.2060	207.748	29944.4	31541.5	243.738	115.90	155.79	693
370.000	8.560	.11683	3.8985	186.179	31480.5	33116.0	248.052	118.03	159.25	657
380.000	8.347	.11981	3.6042	166.116	33045.3	34722.6	252.347	120.42	163.07	622
390.000	8.126	.12307	3.3223	147.590	34643.3	36366.2	256.633	123.24	167.41	587
400.000	7.896	.12664	3.0521	130.648	36286.1	38059.1	260.919	126.44	172.18	553
410.000	7.658	.13058	2.7934	115.347	37993.2	39821.2	263.716	136.21	183.50	517
420.000	7.412	.13491	2.5463	101.744	39163.5	41052.3	268.128	134.93	183.64	488
430.000	7.158	.13970	2.3117	89.874	40943.6	42899.4	272.474	135.97	185.86	459
440.000	6.898	.14496	2.0909	79.721	42740.4	44769.9	276.774	137.50	188.20	433
450.000	6.634	.15073	1.8857	71.187	44552.5	46662.5	281.028	139.24	190.31	409
460.000	6.369	.15700	1.6980	64.098	46376.9	48575.0	285.231	141.10	192.11	387
470.000	6.105	.16379	1.5289	58.224	48210.8	50503.9	289.379	143.03	193.65	368
480.000	5.845	.17109	1.3785	53.337	50052.3	52447.6	293.471	145.00	195.06	351
490.000	5.589	.17892	1.2461	49.261	51900.1	54405.0	297.507	146.99	196.43	336
500.000	5.339	.18729	1.1301	45.891	53754.1	56376.1	301.490	148.97	197.78	323
520.000	4.864	.20561	.9399	41.154	57477.2	60355.8	309.294	152.87	200.06	304
540.000	4.430	.22571	.7944	39.025	61209.8	64369.8	316.868	156.62	201.10	293
560.000	4.052	.24679	.6826	39.062	64936.0	68391.1	324.181	160.21	200.89	290
580.000	3.731	.26806	.5961	40.455	68649.8	72402.7	331.219	163.67	200.27	291
600.000	3.460	.28903	.5282	42.580	72357.0	76403.4	338.001	167.03	199.86	296
620.000	3.232	.30945	.4740	45.170	76067.4	80399.7	344.553	170.30	199.83	301
640.000	3.038	.32921	.4302	47.998	79790.8	84399.8	350.903	173.51	200.25	308
660.000	2.871	.34831	.3941	50.913	83536.1	88412.0	357.077	176.66	201.09	315
680.000	2.726	.36679	.3640	53.831	87310.3	92445.4	363.097	179.75	202.26	322
700.000	2.599	.38472	.3385	56.7C9	91118.6	96504.6	368.980	182.77	203.70	329

Table 22. Continued

I-BUTANE ISOBAR AT P = 160 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
119.614	12.772	.07830	22.5140	1456.390	419.5	1672.2	111.848	73.79	99.31	1836
120.000	12.766	.07833	22.4422	1451.846	457.2	1710.6	112.168	73.83	99.37	1833
130.000	12.612	.07929	20.6937	1341.020	1443.6	2712.3	120.183	74.86	100.96	1763
140.000	12.457	.08027	19.1372	1241.945	2445.4	3729.8	127.726	76.02	102.62	1698
150.000	12.303	.08128	17.7418	1152.614	3463.7	4764.1	134.865	77.30	104.36	1636
160.000	12.150	.08231	16.4832	1071.490	4499.0	5815.9	141.658	78.69	106.18	1577
170.000	11.996	.08336	15.3420	997.336	5552.4	6886.2	148.151	80.17	108.06	1520
180.000	11.842	.08445	14.3024	929.166	6624.6	7975.7	154.382	81.74	110.00	1466
190.000	11.688	.08556	13.3513	866.175	7716.3	9085.3	160.383	83.38	112.00	1414
200.000	11.534	.08670	12.4779	807.706	8828.4	10215.6	166.180	85.09	114.07	1364
210.000	11.379	.08788	11.6730	753.203	9961.4	11367.5	171.797	86.85	116.19	1316
220.000	11.224	.08910	10.9289	702.224	11116.0	12541.6	177.252	88.65	118.36	1270
230.000	11.068	.09035	10.2389	654.384	12292.8	13738.5	182.562	90.50	120.58	1224
240.000	10.911	.09165	9.5974	609.364	13492.4	14958.9	187.742	92.38	122.86	1180
250.000	10.752	.09300	8.9994	566.898	14715.2	16203.2	192.804	94.29	125.18	1137
260.000	10.593	.09440	8.4404	526.762	15961.6	17472.1	197.760	96.22	127.56	1096
270.000	10.432	.09586	7.9168	488.771	17232.1	18765.8	202.619	98.16	129.98	1055
280.000	10.269	.09738	7.4252	452.771	18526.8	20084.9	207.391	100.12	132.45	1015
290.000	10.104	.09897	6.9625	418.637	19846.1	21429.7	212.083	102.08	134.97	975
300.000	9.936	.10064	6.5263	386.266	21190.2	22800.5	216.702	104.04	137.55	937
310.000	9.766	.10240	6.1143	355.576	22559.3	24197.6	221.255	106.01	140.18	899
320.000	9.592	.10425	5.7242	326.501	23953.3	25621.3	225.748	107.97	142.88	862
330.000	9.415	.10621	5.3544	298.989	25372.3	27071.7	230.186	109.94	145.64	825
340.000	9.234	.10830	5.0032	273.003	26816.3	28549.0	234.576	111.91	148.47	789
350.000	9.048	.11052	4.6691	248.513	28285.2	30053.5	238.922	113.89	151.39	753
360.000	8.858	.11289	4.3510	225.506	29779.6	31585.3	243.229	115.91	154.42	718
370.000	8.662	.11544	4.0477	203.973	31297.9	33145.0	247.503	118.04	157.64	684
380.000	8.461	.11819	3.7583	183.921	32843.1	34734.2	251.751	120.43	161.19	650
390.000	8.254	.12116	3.4819	165.368	34418.8	36357.4	255.985	123.25	165.22	617
400.000	8.040	.12438	3.2179	148.344	36036.6	38026.7	260.210	126.45	169.64	585
410.000	7.820	.12788	2.9660	132.886	37115.5	39161.6	262.940	136.21	180.60	550
420.000	7.594	.13169	2.7261	119.036	38855.0	40962.0	267.279	134.93	180.40	523
430.000	7.362	.13583	2.4986	106.817	40601.9	42775.2	271.545	135.96	182.33	496
440.000	7.126	.14033	2.2841	96.217	42363.9	44609.2	275.761	137.47	184.45	471
450.000	6.888	.14518	2.0837	87.169	44140.9	46463.8	279.929	139.20	186.44	448
460.000	6.649	.15040	1.8985	79.542	45930.7	48337.2	284.046	141.03	188.18	427
470.000	6.411	.15598	1.7293	73.148	47730.9	50226.6	288.110	142.93	189.68	408
480.000	6.176	.16190	1.5764	67.778	49539.6	52130.1	292.117	144.87	191.00	392
490.000	5.946	.16817	1.4394	63.233	51355.6	54046.3	296.068	146.83	192.23	377
500.000	5.721	.17478	1.3174	59.357	53178.2	55974.7	299.964	148.79	193.46	364
520.000	5.290	.18903	1.1131	53.271	56843.9	59868.4	307.600	152.69	195.91	342
540.000	4.837	.20461	.9520	49.243	60535.6	63809.3	315.036	156.50	198.10	327
560.000	4.519	.22128	.8242	47.230	64247.2	67787.8	322.270	160.18	199.62	318
580.000	4.191	.23863	.7224	46.971	71789.0	71789.0	329.291	163.72	200.41	314
600.000	3.904	.25618	.6407	47.966	71702.8	75801.6	336.093	167.14	200.84	314
620.000	3.655	.27361	.5746	49.693	75444.9	79822.7	342.685	170.46	201.30	317
640.000	3.439	.29076	.5204	51.873	79202.7	83854.8	349.086	173.70	201.95	322
660.000	3.252	.30752	.4756	54.355	82981.7	87902.0	355.313	176.85	202.83	327
680.000	3.088	.32385	.4380	57.007	86787.7	91969.3	361.384	179.94	203.94	333
700.000	2.943	.33976	.4062	59.733	90625.1	96061.2	367.314	182.96	205.28	339

152

Table 22. Continued

I-BUTANE ISOBAR AT P = 180 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
120.272	12.776	.07827	22.5543	1469.670	462.6	1871.5	112.204	73.85	99.36	1844
130.000	12.626	.07920	20.8502	1361.303	1420.1	2845.7	119.990	74.86	100.90	1776
140.000	12.473	.08017	19.2885	1261.604	2419.5	3862.6	127.528	76.02	102.56	1711
150.000	12.321	.08116	17.8886	1171.759	3435.2	4896.2	134.663	77.31	104.29	1649
160.000	12.168	.08218	16.6261	1090.203	4468.0	5947.3	141.451	78.70	106.10	1590
170.000	12.016	.08322	15.4816	1015.690	5518.6	7016.7	147.939	80.18	107.96	1533
180.000	11.863	.08429	14.4391	947.221	6587.9	8105.2	154.164	81.74	109.90	1480
190.000	11.711	.08539	13.4855	883.984	7676.6	9213.7	160.159	83.39	111.89	1428
200.000	11.558	.08652	12.6100	825.314	8785.4	10342.7	165.950	85.09	113.93	1378
210.000	11.405	.08768	11.8034	770.659	9914.9	11493.2	171.559	86.85	116.04	1330
220.000	11.252	.08888	11.0578	719.548	11065.9	12665.7	177.007	88.66	118.19	1284
230.000	11.098	.09011	10.3667	671.615	12238.8	13860.8	182.309	90.51	120.39	1239
240.000	10.943	.09138	9.7243	626.530	13434.2	15079.1	187.480	92.39	122.64	1196
250.000	10.787	.09270	9.1256	584.023	14652.4	16321.0	192.533	94.30	124.93	1153
260.000	10.630	.09407	8.5663	543.868	15893.9	17587.2	197.478	96.23	127.27	1112
270.000	10.472	.09549	8.0426	505.876	17159.0	18877.8	202.326	98.17	129.65	1072
280.000	10.312	.09697	7.5512	469.890	18447.9	20193.4	207.084	100.12	132.07	1032
290.000	10.151	.09852	7.0890	435.783	19760.9	21534.2	211.762	102.09	134.54	994
300.000	9.987	.10013	6.6536	403.448	21098.0	22900.4	216.365	104.05	137.06	956
310.000	9.821	.10183	6.2425	372.800	22459.3	24292.2	220.901	106.02	139.61	919
320.000	9.652	.10361	5.8539	343.770	23844.8	25709.7	225.375	107.98	142.22	882
330.000	9.480	.10548	5.4858	316.304	25254.4	27153.1	229.792	109.95	144.88	846
340.000	9.305	.10747	5.1366	290.360	26687.9	28622.3	234.157	111.91	147.60	811
350.000	9.126	.10958	4.8050	265.906	28145.1	30117.4	238.476	113.90	150.39	777
360.000	8.943	.11181	4.4897	242.922	29625.7	31638.4	242.752	115.92	153.26	743
370.000	8.756	.11420	4.1896	221.394	31130.0	33185.6	246.992	118.05	156.30	710
380.000	8.565	.11676	3.9038	201.321	32658.8	34760.4	251.202	120.44	159.65	677
390.000	8.369	.11950	3.6314	182.711	34216.2	36367.1	255.393	123.26	163.45	645
400.000	8.167	.12244	3.3720	165.580	35813.7	38017.6	259.571	126.46	167.64	614
410.000	7.961	.12561	3.1249	149.955	36870.3	39131.3	262.248	136.23	178.35	581
420.000	7.751	.12902	2.8901	135.859	38585.6	40908.0	266.529	134.94	177.92	555
430.000	7.536	.13270	2.6676	123.309	40306.9	42695.4	270.735	135.96	179.66	529
440.000	7.318	.13664	2.4576	112.297	42042.4	44501.9	274.838	137.47	181.66	505
450.000	7.099	.14087	2.2608	102.774	43792.7	46328.3	278.992	139.18	183.59	482
460.000	6.879	.14537	2.0776	94.643	45556.3	48173.0	283.047	141.00	185.33	462
470.000	6.660	.15014	1.9087	87.756	47331.6	50034.2	287.050	142.88	186.87	444
480.000	6.444	.15517	1.7544	81.934	49116.6	51909.7	290.938	144.80	188.21	426
490.000	6.232	.16045	1.6144	76.987	50909.9	53798.1	294.892	146.74	189.44	413
500.000	6.025	.16597	1.4882	72.745	52710.9	55698.4	298.731	148.69	190.62	400
520.000	5.627	.17771	1.2733	65.883	56335.4	59534.1	306.253	152.57	192.98	378
540.000	5.253	.19038	1.1004	60.774	59990.9	63417.6	313.581	156.38	195.36	361
560.000	4.904	.20392	.9606	57.303	63677.2	67347.9	320.727	160.10	197.53	348
580.000	4.583	.21819	.8467	55.450	67391.2	71318.5	327.634	163.69	199.39	340
600.000	4.294	.23291	.7535	55.039	71128.1	75320.4	334.477	167.17	200.74	337
620.000	4.035	.24780	.6767	55.741	74885.7	79346.2	341.078	170.53	201.81	336
640.000	3.907	.26267	.6131	57.183	78664.3	83392.3	347.501	173.80	202.82	338
660.000	3.605	.27736	.5598	59.060	82467.0	87459.5	353.758	176.98	203.92	342
680.000	3.427	.29182	.5149	61.244	86297.3	91550.0	359.864	180.08	205.15	346
700.000	3.268	.30599	.4767	63.636	90158.5	95666.4	365.830	183.10	206.51	351

153

Table 22. Continued

I-BUTANE ISOBAR AT P = 200 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
120.912	12.779	.07825	22.5972	1483.132	504..	2069.1	112.544	73.92	99.41	1852
130.000	12.641	.07911	21.0058	1381.593	1397.0	2979.1	119.799	74.86	100.85	1789
140.000	12.489	.08007	19.4388	1281.263	2394.1	3995.5	127.333	76.03	102.50	1723
150.000	12.339	.08105	18.0344	1190.894	3407.4	5028.4	134.463	77.31	104.22	1661
160.000	12.186	.08206	16.7681	1108.899	4437.6	6078.8	141.246	78.70	106.02	1603
170.000	12.035	.08309	15.6202	1034.018	5485.5	7147.3	147.729	80.18	107.88	1547
180.000	11.884	.08415	14.5747	965.242	6552.0	8234.9	153.949	81.75	109.80	1493
190.000	11.733	.08523	13.6186	901.750	7637.7	9342.3	159.938	83.39	111.77	1442
200.000	11.582	.08634	12.7409	842.870	8743.4	10470.2	165.723	85.09	113.81	1392
210.000	11.431	.08748	11.9324	788.045	9869.6	11619.3	171.326	86.85	115.89	1345
220.000	11.279	.08866	11.1853	736.801	11017.1	12790.2	176.766	88.66	118.03	1299
230.000	11.127	.08987	10.4929	688.764	12186.2	13983.6	182.061	90.51	120.21	1254
240.000	10.974	.09112	9.8495	643.602	13377.5	15200.0	187.223	92.39	122.43	1211
250.000	10.821	.09241	9.2500	601.043	14591.5	16439.7	192.267	94.30	124.70	1169
260.000	10.667	.09375	8.6903	560.856	15828.3	17703.3	197.202	96.23	127.00	1128
270.000	10.511	.09514	8.1663	522.849	17088.4	18991.2	202.039	98.18	129.35	1088
280.000	10.354	.09658	7.6749	486.864	18371.9	20303.5	206.786	100.13	131.73	1049
290.000	10.196	.09808	7.2130	452.768	19678.9	21640.5	211.451	102.09	134.15	1011
300.000	10.035	.09965	6.7780	420.453	21009.6	23002.5	216.040	104.06	136.61	974
310.000	9.873	.10128	6.3678	389.830	22363.8	24389.5	220.560	106.02	139.10	938
320.000	9.709	.10300	5.9801	360.827	23741.6	25801.6	225.016	107.99	141.64	902
330.000	9.542	.10480	5.6133	333.387	25142.6	27238.7	229.414	109.95	144.21	867
340.000	9.372	.10670	5.2657	307.464	26566.8	28700.8	233.758	111.92	146.83	833
350.000	9.195	.10871	4.9360	283.024	28013.6	30187.7	238.053	113.91	149.52	799
360.000	9.023	.11083	4.6229	260.040	29482.8	31699.3	242.303	115.93	152.27	766
370.000	8.843	.11308	4.3252	238.495	30974.3	33235.9	246.514	118.06	155.17	734
380.000	8.660	.11547	4.0422	218.380	32489.2	34798.6	250.692	120.45	158.36	702
390.000	8.473	.11802	3.7729	199.695	34031.2	36391.5	254.846	123.27	162.00	671
400.000	8.282	.12074	3.5168	182.446	35611.7	38026.5	258.985	126.47	166.00	641
410.000	8.088	.12364	3.2733	166.648	36650.1	39123.0	261.620	136.24	176.54	609
420.000	7.890	.12675	3.0422	152.314	38345.8	40880.8	265.856	134.95	175.95	584
430.000	7.688	.13007	2.8232	139.454	40046.4	42647.7	270.013	135.97	177.55	559
440.000	7.485	.13360	2.6165	128.061	41760.7	44432.7	274.117	137.48	179.46	536
450.000	7.280	.13736	2.4222	118.098	43489.7	46236.9	278.171	139.18	181.36	514
460.000	7.075	.14134	2.2407	109.493	45232.6	48059.4	282.177	140.99	183.13	494
470.000	6.871	.14553	2.0722	102.130	46988.1	49898.7	286.133	142.86	184.71	476
480.000	6.670	.14993	1.9170	95.861	48754.5	51753.0	290.037	144.76	186.13	460
490.000	6.472	.15452	1.7749	90.516	50530.4	53620.8	293.888	146.69	187.41	446
500.000	6.278	.15929	1.6456	85.932	52315.1	55500.9	297.686	148.62	188.60	433
520.000	5.905	.16935	1.4223	78.484	55909.1	59296.1	305.128	152.48	190.92	411
540.000	5.553	.18008	1.2399	72.729	59536.7	63138.2	312.378	156.29	193.31	393
560.000	5.223	.19145	1.0904	68.363	63199.4	67028.5	319.452	160.02	195.72	379
580.000	4.916	.20343	.9669	65.346	66897.1	70965.8	326.360	163.64	197.98	368
600.000	4.632	.21590	.8642	63.663	70627.7	74945.7	333.106	167.15	199.96	361
620.000	4.373	.22868	.7783	63.186	74388.4	78962.0	339.691	170.55	201.64	358
640.000	4.139	.24161	.7062	63.686	78177.5	83009.7	346.116	173.85	203.11	357
660.000	3.929	.25453	.6453	64.893	81994.9	87085.6	352.387	177.05	204.49	359
680.000	3.740	.26735	.5935	66.555	85842.2	91189.2	358.512	180.17	205.89	361
700.000	3.571	.28001	.5491	68.504	89721.3	95321.6	364.502	183.21	207.36	365

Table 22. Continued

I-BUTANE ISOBAR AT P = 220 BAR

T	DEN	VOL	DP/DT	DP/CD	E	H	S	CV	CP	W
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
121.535	12.783	.07823	22.6424	1496.763	544.0	2265.0	112.869	73.98	99.46	1860
130.000	12.655	.07902	21.1606	1401.892	1374.2	3112.6	119.610	74.87	100.79	1801
140.000	12.505	.07997	19.5883	1300.923	2369.1	4128.4	127.139	76.03	102.44	1736
150.000	12.354	.08094	18.1794	1210.032	3379.9	5160.7	134.265	77.31	104.16	1674
160.000	12.204	.08194	16.9090	1127.578	4407.7	6210.4	141.044	78.70	105.94	1615
170.000	12.054	.08296	15.7577	1052.322	5453.1	7278.1	147.521	80.19	107.79	1560
180.000	11.905	.08400	14.7093	983.231	6516.8	8364.8	153.736	81.75	109.70	1506
190.000	11.755	.08507	13.7506	919.476	7599.7	9471.2	159.720	83.39	111.67	1455
200.000	11.606	.08617	12.8707	860.378	8702.3	10597.9	165.499	85.10	113.69	1406
210.000	11.456	.08729	12.0602	805.373	9825.4	11745.8	171.096	86.86	115.76	1358
220.000	11.306	.08845	11.3115	753.994	10969.4	12915.3	176.529	88.67	117.87	1313
230.000	11.156	.08964	10.6177	705.837	12135.0	14107.0	181.817	90.52	120.03	1269
240.000	11.005	.09087	9.9732	660.588	13322.5	15321.5	186.972	92.40	122.24	1226
250.000	10.854	.09213	9.3728	617.965	14532.3	16559.2	192.007	94.31	124.48	1184
260.000	10.702	.09344	8.8124	577.735	15764.8	17820.5	196.933	96.24	126.75	1144
270.000	10.549	.09480	8.2881	539.702	17020.1	19105.7	201.760	98.18	129.06	1104
280.000	10.395	.09620	7.7965	503.704	18298.5	20415.0	206.496	100.14	131.41	1066
290.000	10.239	.09767	7.3346	469.606	19600.0	21748.7	211.149	102.10	133.79	1028
300.000	10.082	.09919	6.9000	437.296	20924.7	23106.8	215.725	104.06	136.20	992
310.000	9.923	.10077	6.4902	406.683	22272.4	24489.4	220.230	106.03	138.64	956
320.000	9.763	.10243	6.1033	377.692	23643.1	25896.5	224.671	108.00	141.11	921
330.000	9.600	.10417	5.7375	350.261	25036.4	27328.0	229.051	109.96	143.61	887
340.000	9.435	.10599	5.3911	324.344	26452.1	28783.8	233.376	111.93	146.16	853
350.000	9.268	.10790	5.0628	299.900	27889.6	30263.4	237.650	113.92	148.75	820
360.000	9.097	.10992	4.7513	276.900	29348.7	31766.9	241.878	115.94	151.40	788
370.000	8.924	.11205	4.4556	255.321	30829.1	33294.3	246.063	118.07	154.19	757
380.000	8.748	.11431	4.1746	235.149	32331.3	34846.6	250.213	120.46	157.26	726
390.000	8.569	.11669	3.9077	216.377	33860.6	36427.9	254.338	123.29	160.77	696
400.000	8.387	.11923	3.6541	199.004	35426.9	38049.9	258.444	126.49	164.64	667
410.000	8.202	.12192	3.4132	183.033	36449.8	39132.0	261.043	136.25	175.04	636
420.000	8.014	.12478	3.1847	168.472	38129.2	40874.2	265.241	134.96	174.33	611
430.000	7.824	.12781	2.9684	155.323	39812.7	42624.5	269.360	135.99	175.83	587
440.000	7.632	.13102	2.7640	143.577	41509.5	44392.0	273.423	137.49	177.68	564
450.000	7.440	.13442	2.5716	133.206	43221.0	46178.2	277.437	139.19	179.55	543
460.000	7.247	.13800	2.3913	124.156	44946.8	47982.7	281.403	140.99	181.34	524
470.000	7.055	.14175	2.2232	116.335	46685.9	49804.4	285.321	142.85	182.98	506
480.000	6.865	.14567	2.0674	109.622	48436.9	51641.7	289.189	144.75	184.47	490
490.000	6.678	.14975	1.9238	103.874	50198.7	53493.2	293.007	146.67	185.82	475
500.000	6.495	.15398	1.7920	98.938	51970.3	55357.7	296.773	148.59	187.07	462
520.000	6.141	.16283	1.5620	90.936	55540.5	59122.7	304.156	152.43	189.42	440
540.000	5.808	.17218	1.3716	84.714	59146.5	62934.6	311.349	156.23	191.78	422
560.000	5.494	.18202	1.2137	79.791	62789.8	66794.4	318.368	159.95	194.21	408
580.000	5.199	.19233	1.0821	76.015	66471.6	70703.0	325.225	163.59	196.64	396
600.000	4.924	.20307	.9715	73.378	70191.5	74659.0	331.931	167.12	198.94	387
620.000	4.670	.21414	.8780	71.862	73948.2	78659.3	338.489	170.54	201.04	381
640.000	4.436	.22544	.7985	71.371	77739.7	82699.3	344.902	173.87	202.93	378
660.000	4.222	.23685	.7307	71.737	81564.6	86775.2	351.173	177.09	204.65	377
680.000	4.028	.24826	.6725	72.758	85422.7	90884.5	357.307	180.23	206.28	378
700.000	3.852	.25961	.6223	74.241	89314.6	95026.1	363.310	183.28	207.89	380

155

Table 22. Continued

I-BUTANE ISOBAR AT P = 250 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
122.440	12.790	.07819	22.7139	1517.473	601.3	2556.0	113.331	74.08	99.53	1872
130.000	12.677	.07889	21.3911	1432.362	1340.8	3313.0	119.329	74.87	100.72	1820
140.000	12.527	.07982	19.8108	1330.417	2332.3	4328.0	126.852	76.04	102.35	1755
150.000	12.379	.08078	18.3950	1238.703	3339.8	5359.4	133.972	77.32	104.06	1693
160.000	12.230	.08176	17.1187	1155.570	4363.9	6408.0	140.744	78.71	105.83	1635
170.000	12.082	.08276	15.9622	1079.736	5405.5	7474.6	147.215	80.19	107.67	1579
180.000	11.935	.08379	14.9092	1010.159	6465.3	8560.0	153.423	81.76	109.57	1526
190.000	11.787	.08484	13.9465	945.996	7544.0	9665.0	159.399	83.40	111.52	1475
200.000	11.640	.08591	13.0631	886.555	8642.3	10790.1	165.169	85.10	113.52	1426
210.000	11.493	.08701	12.2496	831.267	9760.8	11936.1	170.757	86.87	115.57	1379
220.000	11.345	.08814	11.4983	779.655	10900.0	13103.6	176.182	88.68	117.66	1334
230.000	11.198	.08931	10.8023	731.313	12060.5	14293.1	181.459	90.52	119.79	1290
240.000	11.050	.09050	10.1559	685.917	13242.6	15505.1	186.603	92.41	121.97	1248
250.000	10.901	.09173	9.5541	643.180	14446.6	16739.9	191.626	94.32	124.17	1206
260.000	10.753	.09300	8.9925	602.864	15672.9	17997.0	196.540	96.25	126.41	1167
270.000	10.603	.09431	8.4673	564.771	16921.6	19279.5	201.353	98.19	128.68	1128
280.000	10.453	.09567	7.9752	528.733	18193.0	20584.7	206.074	100.15	130.98	1090
290.000	10.301	.09708	7.5131	494.609	19486.9	21913.7	210.711	102.11	133.30	1053
300.000	10.149	.09853	7.0785	462.285	20803.3	23266.7	215.269	104.08	135.64	1018
310.000	9.995	.10005	6.6941	431.663	22142.2	24643.4	219.756	106.04	138.02	983
320.000	9.840	.10163	6.2829	402.665	23503.2	26044.0	224.175	108.01	140.41	948
330.000	9.683	.10328	5.9180	375.225	24886.2	27468.1	228.533	109.98	142.83	915
340.000	9.524	.10500	5.5728	349.289	26290.6	28915.4	232.833	111.95	145.27	883
350.000	9.364	.10679	5.2460	324.815	27715.9	30385.8	237.080	113.94	147.76	851
360.000	9.201	.10868	4.9363	301.766	29161.7	31878.7	241.277	115.95	150.29	820
370.000	9.037	.11066	4.6426	280.115	30627.8	33394.3	245.431	118.09	152.95	790
380.000	8.870	.11274	4.3639	259.840	32115.0	34933.6	249.546	120.48	155.88	760
390.000	8.701	.11493	4.0994	240.924	33627.0	36500.4	253.633	123.31	159.24	731
400.000	8.529	.11724	3.8484	223.358	35175.4	38106.4	257.699	126.51	162.97	703
410.000	8.356	.11967	3.6103	207.135	36179.3	39171.1	260.255	136.28	173.22	673
420.000	8.181	.12224	3.3846	192.252	37838.5	40894.4	264.407	134.99	172.38	649
430.000	8.004	.12494	3.1708	178.702	39501.2	42624.6	268.479	136.01	173.77	626
440.000	7.826	.12778	2.9688	166.478	41176.6	44371.0	272.493	137.51	175.54	604
450.000	7.648	.13076	2.7783	155.553	42866.7	46135.7	276.459	139.21	177.39	583
460.000	7.469	.13388	2.5992	145.890	44571.5	47918.6	280.378	141.01	179.19	564
470.000	7.292	.13714	2.4315	137.424	46290.5	49719.1	284.250	142.86	180.89	547
480.000	7.116	.14054	2.2750	130.066	48022.6	51536.0	288.075	144.75	182.48	531
490.000	6.942	.14405	2.1296	123.706	49767.0	53368.2	291.853	146.66	183.94	516
500.000	6.772	.14768	1.9951	118.217	51522.5	55214.4	295.583	148.57	185.29	503
520.000	6.442	.15524	1.7571	109.334	55064.5	58945.2	302.899	152.39	187.78	481
540.000	6.129	.16315	1.5567	102.479	58645.9	62724.8	310.030	156.17	190.16	463
560.000	5.834	.17140	1.3882	96.996	62267.0	66552.0	316.990	159.89	192.58	448
580.000	5.556	.17997	1.2461	92.544	65928.9	70428.2	323.790	163.53	195.05	435
600.000	5.295	.18884	1.1255	89.010	69632.9	74354.0	330.445	167.07	197.52	425
620.000	5.051	.19800	1.0224	86.383	73378.7	78328.6	336.961	170.52	199.93	417
640.000	4.822	.20738	.9337	84.662	77165.6	82350.2	343.345	173.87	202.21	411
660.000	4.609	.21694	.8569	83.805	80992.2	86415.8	349.600	177.12	204.34	407
680.000	4.413	.22661	.7903	83.716	84857.4	90522.7	355.730	180.28	206.33	406
700.000	4.232	.23632	.7323	84.270	88760.4	94668.3	361.738	183.34	208.22	405

156

Table 22. Continued

I-BUTANE ISCBAR AT P = 300 BAR

T	DEN	VOL	DP/DT	DP/CD	E	H	S	CV	CP	W
DEG K	MOL/L	L/MOL	BAR/K	BAR-L/MOL	J/MOL	J/MOL	J/MOL/K	J/MOL/K	J/MOL/K	M/SEC
123.877	12.801	.07812	22.8426	1552.721	690.5	3034.1	114.040	74.23	99.64	1893
130.000	12.711	.07867	21.7714	1483.217	1286.9	3647.1	118.870	74.88	100.60	1851
140.000	12.564	.07959	20.1775	1379.595	2273.2	4660.9	126.384	76.05	102.22	1786
150.000	12.418	.08053	18.7500	1286.478	3275.1	5690.9	133.493	77.33	103.91	1724
160.000	12.273	.08148	17.4637	1202.178	4293.5	6737.9	140.255	78.72	105.67	1666
170.000	12.128	.08245	16.2982	1125.335	5329.1	7802.8	146.716	80.20	107.49	1610
180.000	11.983	.08345	15.2375	1054.911	6382.7	8886.2	152.912	81.77	109.36	1557
190.000	11.839	.08447	14.2679	990.030	7455.0	9989.0	158.876	83.41	111.29	1507
200.000	11.695	.08551	13.3785	929.984	8546.5	11111.7	164.635	85.12	113.26	1459
210.000	11.551	.08657	12.5597	874.186	9657.9	12255.0	170.209	86.88	115.28	1412
220.000	11.408	.08766	11.8037	822.147	10789.6	13419.5	175.619	88.69	117.34	1367
230.000	11.264	.08878	11.1037	773.459	11942.2	14605.6	180.881	90.54	119.44	1324
240.000	11.120	.08992	10.4539	727.776	13116.0	15813.7	186.009	92.42	121.56	1283
250.000	10.977	.09110	9.8491	684.800	14311.2	17044.3	191.016	94.33	123.72	1243
260.000	10.833	.09231	9.2851	644.297	15528.2	18297.6	195.911	96.26	125.91	1204
270.000	10.688	.09356	8.7579	606.056	16767.1	19573.8	200.704	98.21	128.12	1166
280.000	10.544	.09484	8.2642	569.901	18027.8	20873.1	205.404	100.16	130.35	1129
290.000	10.398	.09617	7.8011	535.686	19310.5	22195.6	210.017	102.13	132.60	1093
300.000	10.252	.09754	7.3659	503.286	20614.6	23541.1	214.550	104.10	134.86	1059
310.000	10.106	.09895	6.9562	472.599	21941.0	24909.6	219.010	106.06	137.14	1025
320.000	9.958	.10042	6.5701	443.538	23288.3	26300.9	223.400	108.03	139.44	992
330.000	9.809	.10194	6.2058	416.030	24656.4	27714.8	227.726	110.00	141.75	960
340.000	9.660	.10352	5.8615	390.014	26045.0	29150.7	231.992	111.97	144.07	929
350.000	9.509	.10517	5.5359	365.441	27453.4	30608.4	236.202	113.96	146.42	898
360.000	9.357	.10688	5.2277	342.267	28881.1	32087.3	240.360	115.98	148.82	869
370.000	9.203	.10866	4.9358	320.455	30327.7	33587.5	244.471	118.12	151.33	840
380.000	9.049	.11051	4.6591	299.975	31794.2	35109.7	248.541	120.51	154.10	812
390.000	8.893	.11245	4.3969	280.802	33284.3	36657.8	252.580	123.34	157.30	784
400.000	8.735	.11448	4.1482	262.915	34809.3	38243.6	256.594	126.55	160.86	758
410.000	8.577	.11659	3.9125	246.291	35788.7	39286.4	259.096	136.31	170.95	728
420.000	8.418	.11880	3.6892	230.920	37422.3	40986.2	263.192	135.03	169.96	707
430.000	8.258	.12110	3.4777	216.784	39058.6	42691.6	267.205	136.05	171.23	685
440.000	8.097	.12350	3.2777	203.869	40707.1	44412.2	271.160	137.55	172.92	664
450.000	7.936	.12600	3.0886	192.152	42370.2	46150.3	275.066	139.25	174.72	644
460.000	7.776	.12861	2.9104	181.606	44048.4	47906.6	278.926	141.05	176.53	625
470.000	7.616	.13130	2.7426	172.186	45741.7	49680.8	282.742	142.90	178.30	607
480.000	7.457	.13410	2.5850	163.841	47449.4	51472.3	286.514	144.78	179.99	591
490.000	7.301	.13698	2.4375	156.498	49170.9	53280.2	290.241	146.68	181.59	577
500.000	7.146	.13994	2.2996	150.070	50905.2	55103.7	293.925	148.59	183.09	564
520.000	6.846	.14608	2.0519	139.566	54411.2	58793.7	301.161	152.39	185.86	541
540.000	6.559	.15247	1.8386	131.515	57962.5	62536.7	308.224	156.15	188.42	522
560.000	6.286	.15907	1.6559	125.185	61557.7	66329.8	315.121	159.85	190.89	507
580.000	6.029	.16586	1.4994	120.038	65196.7	70172.3	321.863	163.48	193.36	494
600.000	5.787	.17281	1.3648	115.753	68880.1	74064.5	328.460	167.03	195.86	483
620.000	5.557	.17994	1.2485	112.179	72608.7	78006.8	334.923	170.49	198.38	473
640.000	5.341	.18722	1.1473	109.270	76382.7	81999.4	341.261	173.85	200.87	466
660.000	5.137	.19465	1.0587	107.024	80201.8	86041.4	347.480	177.13	203.31	459
680.000	4.945	.20221	.9808	105.440	84065.2	90131.4	353.585	180.31	205.67	454
700.000	4.765	.20986	.9120	104.499	87971.9	94267.6	359.579	183.40	207.93	451

Table 22.   Continued

I-BUTANE ISOBAR AT P = 350 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
125.235	12.813	.07805	22.9809	1588.742	772.9	3504.5	114.682	74.39	99.74	1914
130.000	12.744	.07847	22.1467	1534.140	1235.2	3981.6	118.420	74.90	100.49	1881
140.000	12.600	.07937	20.5393	1428.819	2216.4	4994.1	125.926	76.06	102.10	1816
150.000	12.457	.08028	19.1000	1334.255	3213.1	6022.8	133.026	77.34	103.78	1754
160.000	12.314	.08121	17.8033	1248.720	4226.1	7068.4	139.779	78.73	105.52	1696
170.000	12.171	.08216	16.6288	1170.843	5256.1	8131.7	146.230	80.22	107.32	1641
180.000	12.030	.08313	15.5600	1099.530	6303.9	9213.4	152.416	81.78	109.17	1589
190.000	11.888	.08412	14.5834	1033.891	7370.2	10314.2	158.370	83.43	111.08	1538
200.000	11.748	.08512	13.6876	973.197	8455.4	11434.8	164.117	85.13	113.03	1490
210.000	11.607	.08615	12.8633	916.847	9560.2	12575.7	169.680	86.89	115.03	1445
220.000	11.467	.08721	12.1023	864.339	10685.2	13737.4	175.078	88.70	117.06	1400
230.000	11.327	.08828	11.3979	815.252	11830.6	14920.5	180.326	90.55	119.12	1358
240.000	11.187	.08939	10.7442	769.233	12996.8	16125.4	185.440	92.44	121.22	1317
250.000	11.048	.09052	10.1361	725.983	14184.2	17352.3	190.431	94.35	123.34	1277
260.000	10.908	.09168	9.5691	685.241	15392.9	18601.5	195.311	96.28	125.48	1239
270.000	10.768	.09287	9.0394	646.803	16622.9	19873.2	200.087	98.23	127.64	1202
280.000	10.628	.09409	8.5436	610.482	17874.5	21167.5	204.768	100.18	129.82	1166
290.000	10.488	.09534	8.0787	576.123	19147.3	22484.4	209.362	102.15	132.01	1131
300.000	10.348	.09664	7.6421	543.597	20441.4	23823.7	213.874	104.12	134.22	1098
310.000	10.207	.09797	7.2315	512.794	21756.5	25185.5	218.311	106.09	136.43	1065
320.000	10.066	.09935	6.8447	483.620	23092.2	26569.3	222.678	108.06	138.65	1033
330.000	9.924	.10076	6.4799	455.996	24448.1	27974.8	226.979	110.02	140.88	1002
340.000	9.782	.10223	6.1354	429.855	25823.6	29401.7	231.217	112.00	143.12	972
350.000	9.639	.10375	5.8099	405.141	27218.1	30849.4	235.399	113.99	145.38	942
360.000	9.495	.10532	5.5020	381.814	28631.2	32317.4	239.526	116.01	147.67	914
370.000	9.350	.10695	5.2106	359.801	30062.4	33805.5	243.604	118.15	150.08	886
380.000	9.205	.10863	4.9345	339.096	31512.6	35314.8	247.640	120.55	152.75	859
390.000	9.059	.11038	4.6730	319.656	32985.5	36848.9	251.641	123.38	155.84	833
400.000	8.913	.11220	4.4252	301.451	34492.7	38419.6	255.618	126.58	159.29	807
410.000	8.766	.11408	4.1904	284.456	35453.4	39446.2	258.080	136.35	169.29	779
420.000	8.618	.11603	3.9678	268.648	37067.9	41129.0	262.135	135.07	168.21	758
430.000	8.470	.11806	3.7570	254.004	38684.4	42816.4	266.105	136.09	169.40	737
440.000	8.323	.12016	3.5574	240.503	40312.9	44518.3	270.018	137.60	171.02	717
450.000	8.175	.12233	3.3686	228.122	41955.8	46237.3	273.881	139.29	172.79	697
460.000	8.027	.12457	3.1901	216.835	43614.1	47974.2	277.698	141.09	174.60	679
470.000	7.881	.12689	3.0216	206.610	45287.9	49729.2	281.473	142.95	176.39	662
480.000	7.735	.12928	2.8628	197.406	46976.9	51501.9	285.205	144.83	178.14	646
490.000	7.591	.13174	2.7133	189.176	48680.8	53291.7	288.895	146.73	179.82	631
500.000	7.448	.13426	2.5729	181.858	50399.0	55098.1	292.544	148.63	181.44	618
520.000	7.170	.13947	2.3179	169.679	53875.8	58757.3	299.720	152.42	184.45	594
540.000	6.902	.14488	2.0950	160.234	57403.6	62474.3	306.734	156.17	187.22	574
560.000	6.647	.15044	1.9011	152.863	60979.6	66244.9	313.590	159.86	189.83	558
580.000	6.405	.15613	1.7328	146.983	64602.4	70066.9	320.295	163.48	192.36	545
600.000	6.176	.16193	1.5865	142.155	68271.9	73939.3	326.859	167.03	194.88	534
620.000	5.958	.16783	1.4589	138.088	71988.0	77862.1	333.290	170.48	197.40	524
640.000	5.753	.17383	1.3471	134.624	75751.2	81835.3	339.597	173.85	199.92	516
660.000	5.558	.17992	1.2486	131.692	79561.5	85858.8	345.788	177.13	202.43	508
680.000	5.373	.18611	1.1614	129.271	83418.5	89932.2	351.868	180.33	204.90	502
700.000	5.198	.19237	1.0838	127.360	87321.8	94054.6	357.842	183.43	207.32	497

158

Table 22. Continued

I-BUTANE ISCBAR AT P = 400 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
126.521	12.826	.07797	23.1271	1625.437	849.2	3968.0	115.265	74.53	99.84	1935
130.000	12.776	.07827	22.5175	1585.190	1185.4	4316.2	117.981	74.91	100.38	1911
140.000	12.634	.07915	20.8965	1478.117	2161.8	5327.7	125.478	76.07	101.98	1846
150.000	12.493	.08004	19.4451	1382.047	3153.5	6355.2	132.571	77.36	103.65	1784
160.000	12.353	.08095	18.1380	1295.244	4161.5	7399.5	139.315	78.75	105.38	1726
170.000	12.213	.08188	16.9543	1216.289	5186.2	8461.4	145.757	80.23	107.17	1671
180.000	12.074	.08282	15.8773	1144.045	6228.6	9541.5	151.934	81.80	109.01	1619
190.000	11.936	.08378	14.8934	1077.609	7289.2	10640.5	157.878	83.44	110.89	1569
200.000	11.798	.08476	13.9911	1016.230	8368.6	11759.1	163.615	85.15	112.83	1522
210.000	11.660	.08576	13.1609	959.289	9467.4	12897.8	169.167	86.91	114.80	1476
220.000	11.523	.08678	12.3947	906.273	10586.0	14057.2	174.554	88.72	116.81	1432
230.000	11.387	.08782	11.6856	856.750	11724.8	15237.7	179.791	90.57	118.85	1390
240.000	11.251	.08888	11.0277	810.356	12884.2	16439.6	184.893	92.46	120.91	1350
250.000	11.115	.08997	10.4158	766.783	14064.5	17663.3	189.871	94.37	123.00	1311
260.000	10.979	.09108	9.8455	725.770	15265.6	18909.0	194.736	96.30	125.11	1273
270.000	10.843	.09222	9.3129	687.094	16487.9	20176.8	199.497	98.25	127.23	1237
280.000	10.708	.09339	8.8145	650.561	17731.2	21466.8	204.163	100.21	129.37	1202
290.000	10.572	.09459	8.3474	616.018	18995.5	22779.0	208.741	102.17	131.52	1168
300.000	10.437	.09582	7.9089	583.326	20280.5	24113.1	213.235	104.14	133.67	1134
310.000	10.301	.09708	7.4966	552.367	21586.1	25469.2	217.654	106.11	135.83	1102
320.000	10.165	.09837	7.1084	523.042	22911.8	26846.7	222.001	108.08	138.00	1071
330.000	10.029	.09971	6.7425	495.267	24257.1	28245.5	226.280	110.05	140.17	1041
340.000	9.893	.10108	6.3972	468.968	25621.6	29664.9	230.497	112.03	142.34	1012
350.000	9.756	.10250	6.0710	444.084	27004.6	31104.5	234.654	114.02	144.54	984
360.000	9.620	.10395	5.7626	420.559	28405.5	32563.7	238.757	116.04	146.76	956
370.000	9.482	.10546	5.4707	398.347	29824.1	34042.4	242.809	118.18	149.10	929
380.000	9.345	.10701	5.1944	377.407	31261.0	35541.4	246.818	120.58	151.69	903
390.000	9.207	.10861	4.9327	357.696	32720.1	37064.6	250.791	123.41	154.71	878
400.000	9.069	.11026	4.6848	339.184	34213.0	38623.6	254.738	126.62	158.09	853
410.000	8.931	.11197	4.4497	321.839	35159.1	39637.9	257.169	136.39	168.02	825
420.000	8.793	.11373	4.2270	305.635	36758.3	41307.6	261.193	135.11	166.87	805
430.000	8.654	.11555	4.0159	290.538	38359.3	42981.3	265.131	136.14	168.01	785
440.000	8.516	.11742	3.8159	276.528	39972.1	44669.1	269.011	137.64	169.59	765
450.000	8.378	.11935	3.6265	263.578	41599.4	46373.5	272.841	139.34	171.33	746
460.000	8.241	.12134	3.4472	251.662	43242.1	48095.8	276.627	141.14	173.12	728
470.000	8.105	.12339	3.2776	240.749	44900.5	49836.0	280.369	142.99	174.92	711
430.000	7.969	.12549	3.1173	230.809	46574.7	51594.2	284.071	144.88	176.70	695
490.000	7.835	.12764	2.9660	221.802	48264.3	53369.9	287.732	146.78	178.44	681
500.000	7.702	.12984	2.8232	213.684	49969.0	55162.7	291.354	148.68	180.12	667
520.000	7.441	.13439	2.5622	199.908	53421.9	58797.4	298.481	152.47	183.31	643
540.000	7.189	.13909	2.3317	188.998	56929.8	62493.5	305.455	156.21	186.26	622
560.000	6.948	.14393	2.1288	180.411	60489.7	66246.7	312.280	159.90	189.04	605
580.000	6.718	.14886	1.9506	173.608	64099.5	70054.0	318.960	163.51	191.68	591
600.000	6.499	.15388	1.7943	168.117	67758.3	73913.5	325.502	167.05	194.26	579
620.000	6.291	.15897	1.6568	163.573	71465.3	77824.0	331.913	170.50	196.80	569
640.000	6.093	.16412	1.5356	159.723	75220.6	81785.3	338.201	173.87	199.32	561
660.000	5.906	.16932	1.4283	156.411	79023.9	85796.9	344.373	177.16	201.84	553
680.000	5.728	.17459	1.3328	153.553	82875.1	89858.7	350.436	180.36	204.33	547
700.000	5.558	.17991	1.2475	151.115	86773.8	93970.1	356.394	183.47	206.80	541

Table 22. Continued

I-BUTANE ISCBAR AT P = 500 BAR

T DEG K	DEN MOL/L	VOL L/MOL	OP/DT BAR/K	OP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
128.910	12.852	.07781	23.4378	1700.555	986.8	4877.1	116.285	74.82	100.03	1977
130.000	12.837	.07790	23.2463	1687.689	1091.3	4986.2	117.128	74.94	100.20	1970
140.000	12.700	.07874	21.5975	1576.926	2058.7	5995.8	124.611	76.11	101.78	1904
150.000	12.563	.07960	20.1221	1477.760	3041.3	7021.1	131.689	77.39	103.43	1843
160.000	12.428	.08047	18.7937	1388.304	4039.8	8063.1	138.418	78.78	105.14	1785
170.000	12.293	.08135	17.5912	1307.074	5054.9	9122.4	144.845	80.26	106.90	1730
180.000	12.158	.08225	16.4974	1232.861	6087.3	10199.7	151.006	81.83	108.71	1678
190.000	12.025	.08316	15.4984	1164.732	7137.6	11295.7	156.933	83.48	110.57	1629
200.000	11.892	.08409	14.5825	1101.872	8206.5	12410.9	162.653	85.18	112.48	1582
210.000	11.760	.08503	13.7401	1043.650	9294.4	13546.0	168.188	86.95	114.41	1537
220.000	11.629	.08599	12.9628	989.518	10401.7	14701.3	173.556	88.76	116.38	1494
230.000	11.498	.08697	12.2437	939.021	11528.9	15877.4	178.773	90.61	118.38	1452
240.000	11.368	.08797	11.5766	891.776	12676.2	17074.5	183.854	92.50	120.40	1413
250.000	11.239	.08898	10.9565	847.458	13843.9	18292.9	188.811	94.41	122.45	1375
260.000	11.110	.09001	10.3787	805.790	15032.1	19532.8	193.653	96.34	124.50	1338
270.000	10.981	.09107	9.8393	766.534	16240.9	20794.2	198.390	98.29	126.57	1303
280.000	10.853	.09214	9.3348	729.489	17470.2	22077.3	203.031	100.25	128.65	1269
290.000	10.725	.09324	8.8622	694.481	18719.9	23381.9	207.582	102.22	130.73	1236
300.000	10.598	.09436	8.4187	661.361	19989.8	24707.8	212.049	104.19	132.81	1204
310.000	10.470	.09551	8.0019	630.001	21279.5	26054.9	216.438	106.16	134.90	1173
320.000	10.344	.09668	7.6097	600.290	22588.8	27422.7	220.754	108.13	136.98	1143
330.000	10.217	.09788	7.2401	572.134	23917.1	28810.9	225.001	110.11	139.07	1115
340.000	10.090	.09910	6.8915	545.450	25263.8	30219.0	229.183	112.08	141.16	1087
350.000	9.964	.10036	6.5624	520.166	26628.3	31646.3	233.306	114.08	143.26	1060
360.000	9.838	.10165	6.2513	496.220	28010.1	33092.3	237.371	116.10	145.39	1033
370.000	9.712	.10296	5.9571	473.555	29408.8	34556.9	241.385	118.25	147.64	1008
380.000	9.587	.10431	5.6785	452.122	30825.2	36040.9	245.353	12(.65	150.14	983
390.000	9.461	.10570	5.4147	431.876	32263.2	37548.1	249.285	123.48	153.06	959
400.000	9.336	.10711	5.1647	412.776	33734.4	39090.1	253.188	126.69	156.35	936
410.000	9.211	.10857	4.9277	394.785	34658.2	40086.6	255.576	136.47	166.19	909
420.000	9.086	.11006	4.7029	377.865	36234.8	41737.7	259.555	135.19	164.97	890
430.000	8.962	.11158	4.4897	361.984	37812.9	43392.0	263.447	136.22	166.03	871
440.000	8.838	.11315	4.2875	347.114	39402.5	45059.8	267.281	137.73	167.56	852
450.000	8.715	.11475	4.0956	333.218	41006.4	46743.7	271.066	139.43	169.26	834
460.000	8.592	.11638	3.9136	320.272	42626.0	48445.1	274.805	141.23	171.03	816
470.000	8.471	.11806	3.7409	308.246	44261.6	5C164.4	278.503	143.09	172.83	800
480.000	8.350	.11976	3.5772	297.111	45913.5	51901.7	282.160	144.98	174.63	784
490.000	8.230	.12151	3.4220	286.837	47581.5	53656.9	285.779	146.88	176.41	769
500.000	8.111	.12329	3.2749	277.391	49265.5	55429.8	289.361	148.78	178.16	755
520.000	7.878	.12694	3.0037	260.848	52680.3	59027.2	296.415	152.57	181.55	730
540.000	7.651	.13070	2.7609	247.179	56155.5	62690.6	303.328	156.31	184.76	708
560.000	7.431	.13456	2.5439	236.030	59688.3	66416.5	310.102	160.00	187.80	690
580.000	7.220	.13850	2.3503	227.015	63276.3	70201.5	316.743	163.61	190.68	674
600.000	7.017	.14250	2.1777	219.740	66917.7	74042.9	323.254	167.14	193.43	661
620.000	6.824	.14655	2.0239	213.836	70610.8	77938.3	329.640	170.59	196.09	650
640.000	6.639	.15063	1.8866	208.979	74354.6	81886.2	335.907	173.96	198.69	640
660.000	6.462	.15474	1.7638	204.912	78148.4	85885.4	342.060	177.24	201.23	632
680.000	6.294	.15887	1.6537	201.441	81991.5	89935.2	348.105	180.44	203.74	625
700.000	6.134	.16303	1.5547	198.433	85883.3	94034.8	354.047	183.55	206.21	619

Table 22. Continued

I-BUTANE ISOBAR AT P = 600 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/CD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
131.094	12.880	.07764	23.7664	1777.6C9	1108.0	5766.4	117.147	75.10	100.21	2020
140.000	12.761	.07836	22.2827	1676.195	1963.0	6664.7	123.778	76.14	101.61	1961
150.000	12.629	.07918	20.7829	1573.750	2937.3	7688.3	130.844	77.43	103.24	1900
160.000	12.497	.08002	19.4328	1481.486	3927.2	8728.2	137.560	78.82	104.93	1842
170.000	12.367	.08086	18.2111	1397.835	4933.6	9785.4	143.974	80.30	106.67	1787
180.000	12.237	.08172	17.1001	1321.529	5957.1	10860.3	150.122	81.87	108.47	1735
190.000	12.108	.08259	16.0856	1251.567	6998.3	11953.8	156.035	83.51	110.31	1686
200.000	11.980	.08347	15.1557	1187.118	8057.8	13066.2	161.741	85.22	112.19	1639
210.000	11.852	.08437	14.3005	1127.501	9136.0	14198.3	167.261	86.99	114.10	1595
220.000	11.726	.08528	13.5115	1072.131	10233.6	15350.4	172.614	88.80	116.04	1552
230.000	11.600	.08620	12.7817	1020.546	11350.7	16522.9	177.815	90.65	118.01	1511
240.000	11.475	.08714	12.1049	972.338	12487.6	17716.2	182.880	92.54	120.00	1472
250.000	11.351	.08810	11.4757	927.163	13644.7	18930.4	187.819	94.45	122.01	1435
260.000	11.228	.08906	10.8896	884.730	14821.9	20165.7	192.644	96.39	124.03	1399
270.000	11.105	.09005	10.3426	844.788	16019.4	21422.3	197.363	98.34	126.06	1364
280.000	10.983	.09105	9.8311	807.122	17237.1	22700.0	201.984	10C.30	128.09	1331
290.000	10.862	.09207	9.3519	771.546	18474.8	23998.9	206.515	102.27	130.13	1299
300.000	10.741	.09310	8.9024	737.9C1	19732.4	25318.6	210.961	104.24	132.17	1268
310.000	10.620	.09416	8.4800	706.048	21009.4	26659.0	215.328	106.21	134.21	1238
320.000	10.500	.09523	8.0826	675.867	22305.8	28019.6	219.621	108.19	136.24	1210
330.000	10.381	.09633	7.7082	647.255	23620.4	29400.1	223.844	110.16	138.27	1182
340.000	10.262	.09744	7.3551	620.121	24953.2	30799.9	228.002	112.14	140.31	1155
350.000	10.144	.09858	7.0218	594.384	26303.5	32218.4	232.099	114.14	142.35	1129
360.000	10.026	.09974	6.7067	569.974	27670.6	33655.1	236.138	116.17	144.43	1104
370.000	9.909	.10092	6.4087	546.830	29054.3	35109.7	240.125	118.31	146.62	1079
380.000	9.792	.10213	6.1266	524.896	30455.5	36583.2	244.065	120.72	149.06	1055
390.000	9.675	.10336	5.8594	504.121	31877.8	38079.3	247.968	123.55	151.93	1032
400.000	9.559	.10461	5.6060	484.459	33333.0	39609.7	251.842	126.77	155.16	1010
410.000	9.444	.10589	5.3657	465.868	34240.7	40594.1	254.200	136.54	164.96	984
420.000	9.329	.10720	5.1377	448.311	35800.9	42232.6	258.148	135.27	163.68	966
430.000	9.214	.10852	4.9212	431.746	37362.4	43873.9	262.010	136.30	164.71	947
440.000	9.101	.10988	4.7156	416.143	38935.4	45528.2	265.813	137.81	166.20	929
450.000	8.988	.11126	4.5204	401.467	40522.8	47198.5	269.567	139.52	167.87	911
460.000	8.876	.11267	4.3349	387.688	42125.8	48885.9	273.275	141.32	169.63	894
470.000	8.764	.11410	4.1586	374.775	43745.1	50591.1	276.942	143.18	171.42	878
480.000	8.654	.11556	3.9911	362.698	45380.9	52314.3	280.570	145.07	173.22	863
490.000	8.544	.11704	3.8319	351.428	47033.2	54055.5	284.160	146.97	175.02	848
500.000	8.436	.11854	3.6806	340.938	48701.9	55814.5	287.714	148.88	176.80	834
520.000	8.222	.12162	3.4003	322.178	52088.1	59385.5	294.716	152.67	180.28	809
540.000	8.014	.12479	3.1473	306.181	55537.6	63024.7	301.583	156.42	183.62	786
560.000	7.811	.12802	2.9191	292.691	59048.1	66729.4	308.320	160.11	186.83	766
580.000	7.615	.13132	2.7134	281.435	62617.5	70496.7	314.929	163.72	189.88	749
600.000	7.426	.13467	2.5281	272.121	66243.7	74323.8	321.416	167.25	192.80	734
620.000	7.243	.13806	2.3612	264.451	69924.8	78208.1	327.784	170.70	195.61	722
640.000	7.069	.14147	2.2107	258.138	73659.1	82147.4	334.037	174.06	198.31	711
660.000	6.901	.14491	2.0750	252.916	77445.4	86140.0	340.180	177.34	200.94	702
680.000	6.740	.14836	1.9524	248.556	81282.7	90184.4	346.217	180.54	203.49	694
700.000	6.587	.15182	1.8413	244.869	85169.9	94279.3	352.152	183.66	206.00	687

Table 22. Continued

I-BUTANE ISCBAR AT P = 700 BAR

T DEG K	DEN MOL/L	VOL L/MOL	DP/DT BAR/K	DP/DD BAR-L/MOL	E J/MOL	H J/MOL	S J/MOL/K	CV J/MOL/K	CP J/MOL/K	W M/SEC
133.107	12.909	.07747	24.1075	1856.286	1216.3	6639.1	117.883	7 !.36	100.37	2062
140.000	12.819	.07801	22.9536	1776.014	1873.9	7334.4	122.977	76.18	101.45	2017
150.000	12.691	.07880	21.4290	1670.131	2840.4	8356.3	130.032	77.46	103.07	1955
160.000	12.563	.07960	20.0572	1574.915	3822.6	9394.6	136.737	78.86	104.75	1897
170.000	12.436	.08041	18.8160	1488.708	4821.0	10449.9	143.140	80.34	106.48	1842
180.000	12.310	.08123	17.6875	1410.201	5836.4	11522.9	149.276	81.91	108.26	1790
190.000	12.185	.08207	16.6571	1338.287	6869.4	12614.2	155.178	83.56	110.09	1741
200.000	12.061	.08291	15.7128	1272.130	7920.5	13724.4	160.872	85.27	111.95	1695
210.000	11.938	.08377	14.8444	1211.003	8990.3	14853.9	166.380	87.03	113.84	1650
220.000	11.816	.08463	14.0434	1154.306	10079.1	16003.3	171.720	88.84	115.77	1608
230.000	11.695	.08551	13.3025	1101.538	11187.3	17173.0	176.909	90.70	117.71	1568
240.000	11.574	.08640	12.6154	1052.276	12315.2	18363.1	181.960	92.59	119.68	1529
250.000	11.455	.08730	11.9768	1006.146	13463.1	19574.0	186.886	94.50	121.66	1492
260.000	11.336	.08821	11.3819	962.859	14630.9	20805.7	191.697	96.44	123.66	1457
270.000	11.218	.08914	10.8266	922.143	15818.2	22058.4	196.401	98.39	125.66	1423
280.000	11.101	.09008	10.3074	883.772	17026.5	23332.5	201.007	100.35	127.66	1390
290.000	10.985	.09103	9.8211	847.550	18254.1	24626.3	205.522	102.32	129.67	1359
300.000	10.870	.09200	9.3649	813.305	19501.4	25941.3	209.952	104.29	131.67	1329
310.000	10.755	.09298	8.9363	780.890	20767.9	27276.6	214.302	106.27	133.68	1299
320.000	10.641	.09398	8.5330	750.177	22053.3	28631.7	218.578	108.24	135.68	1271
330.000	10.527	.09499	8.1531	721.052	23357.1	30006.4	222.783	11(.22	137.67	1244
340.000	10.415	.09602	7.7948	693.419	24678.7	31400.0	226.923	112.20	139.67	1218
350.000	10.303	.09706	7.4564	667.189	26017.5	32811.9	231.000	114.20	141.68	1193
360.000	10.191	.09812	7.1367	642.292	27372.9	34241.6	235.020	116.23	143.72	1168
370.000	10.080	.09920	6.8341	618.646	28744.8	35689.0	238.986	118.38	145.87	1145
380.000	9.970	.10030	6.5477	596.202	30133.8	37154.8	242.906	120.78	148.27	1122
390.000	9.861	.10141	6.2762	574.903	31543.9	38642.8	246.788	123.62	151.11	1099
400.000	9.752	.10254	6.0188	554.698	32986.8	40164.9	250.641	126.84	154.31	1077
410.000	9.644	.10369	5.7745	535.541	33881.9	41140.6	252.977	136.62	164.07	1051
420.000	9.536	.10486	5.5426	517.391	35429.6	42770.0	256.904	135.34	162.77	1034
430.000	9.429	.10605	5.3222	500.2C8	36978.5	44402.0	260.744	136.38	163.77	1016
440.000	9.323	.10726	5.1128	483.956	38538.8	46046.8	264.525	137.89	165.23	998
450.000	9.218	.10848	4.9137	468.600	40113.6	47707.3	268.257	139.60	166.89	981
460.000	9.114	.10972	4.7243	454.106	41704.0	49384.8	271.944	141.41	168.63	965
470.000	9.010	.11099	4.5441	440.440	43310.9	51080.2	275.589	143.27	170.41	949
480.000	8.907	.11227	4.3726	427.577	44934.4	52793.1	279.196	145.16	172.21	934
490.000	8.806	.11356	4.2093	415.486	46574.7	54524.3	282.765	147.07	174.02	919
500.000	8.705	.11488	4.0539	404.139	48231.8	56273.4	286.299	148.97	175.81	905
520.000	8.506	.11756	3.7649	383.566	51595.6	59824.9	293.263	152.77	179.33	880
540.000	8.312	.12030	3.5028	365.644	55024.6	63445.9	300.096	156.52	182.75	857
560.000	8.123	.12310	3.2650	350.159	58516.8	67134.0	306.802	160.21	186.05	836
580.000	7.939	.12595	3.0492	336.895	62070.1	70886.9	313.386	163.82	189.22	818
600.000	7.761	.12884	2.8533	325.626	65682.7	74701.9	319.852	167.36	192.26	802
620.000	7.589	.13177	2.6755	316.122	69352.6	78576.5	326.205	170.81	195.18	788
640.000	7.423	.13472	2.5141	308.150	73078.0	82508.5	332.446	174.17	198.00	776
660.000	7.263	.13769	2.3674	301.483	76857.3	86495.7	338.581	177.45	200.71	765
680.000	7.109	.14067	2.2339	295.905	80689.2	90536.3	344.612	180.65	203.34	756
700.000	6.961	.14367	2.1123	291.222	84572.3	94628.9	350.543	183.76	205.90	749

```
      PROGRAM IBUTHRM(INPUT,OUTPUT)
C    I-BUTANE THERMOFUNCTIONS ON ISOBARS, START OCT. 23, 1978.
      NEW XEF, DENGASF, EOELF, FOR LOW DENSITIES.
      FREEZING LIQUID DEN., (D/DT) = (T/TT)**(0.235), GRAPH., PROPANE.
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER, IX
      COMMON/1/AL,BE,GA,DE,EP, OCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
      COMMON/5/ DDSDT
      COMMON/6/ TSAT, THETA, PSAT
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/9/ ONG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD
      COMMON/12/ DELS, DELCV
      COMMON/13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION PP(99)
    1 FORMAT(I5, 2F10.0)
    2 FORMAT(I5, 3F10.0)
    3 FORMAT(8I10)
    5 FORMAT(1X)
    9 FORMAT(8F10.0)
   14 FORMAT(1H1 18X *I-BUTANE ISOBAR AT P =* F8.5, 4H BAR /)
   15 FORMAT(1H1 18X *I-BUTANE ISOBAR AT P =* I4, 4H BAR /)
   16 FORMAT(19X 1HT 6X3HDEN 6X3HVOL 5X5HOP/DT 5X5HDP/DO
    2 8X1HE 8X1HH 8X1HS 6X2HCV 6X2HCP 5X1HW /
    3 15X 5HDEG K 4X5HMOL/L 4X5HL/MOL 5X5HBAR/K 1X9HBAR-L/MOL 4X5HJ/MOL
    4 4X5HJ/MOL 2X7HJ/MOL/K 1X7HJ/MOL/K 1X7HJ/MOL/K 1X5HM/SEC )
   17 FORMAT(10X F10.3, F9.3, F9.5, F10.4, F10.3, 2F9.1,F9.3,2F8.2,I6)
   18 FORMAT(10X F10.3, F9.5, F9.3, F10.6, F10.3, 2F9.1,F9.3,2F8.2,I6)
   30 CALL PVTDATA
C
C    COMPUTE THERMOFUNCTIONS ON ISOBARS. START ON THE MELTING LINE.
C    ISOBARS AT P UNDER PCRT TRAVERSE THE DOME.
C    NOTE USE OF QVAP ,DATA, TO CROSS THE ,DOME,.
C    NOTE USE OF CSAT ,DATA, FOR SPECIFIC HEATS IN COMPRESSED LIQUID.
   90 IN = 1  $ NI = 57  $ READ 9, (PP(I),I=1,NI)
   91 DO 300 I=IN,NI  $ IP = P = PP(I)  $ IK = I  $ LS = 0
   92 IF(P-IP) 93,94
   93 PRINT 14, P   $   GO TO 95
   94 PRINT 15, IP
   95 PRINT 16
   96 IF(I.EQ.26)  P = PCRT
  100 T = FINDTMF(P)  $ CALL COMPRLD  $ V=1/DEN  $ IW=W
  101 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
  102 IT = T/10  $ IF(P.LT.PCRT) 110,180
C
C    CASES FOR P LESS THAN PCRT.
  110 TS = FINDTSF(P)  $ K = L = 0
  111 DO 150 J=1,99  $ T = JT = 10*(IT+J)
  112 IF(T.LT.TS) 115,117
  115 CALL COMPRLQ  $ V=1/DEN $ IW=W
  116 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW  $  GO TO 150
  117 LS = LS + 1  $ IF(LS.EQ.1) 120,130
      CASE FOR SATURATED LIQUID AND VAPOR.
  120 T = TS  $  CALL COEXIST
  123 V=1/DEN $ VG=1/ONG $ IW=W $ IWG=WG
  124 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW  $  PRINT 5
  125 IF(P.LT.30) 126,127
```

163

```
    126 PRINT 18, T,DNG,VG,DPGDT,DPGDD, EG,HG,SG,CVG,CPG,IWG $ GOTO 128
    127 PRINT 17, T,DNG,VG,DPGDT,DPGDD, EG,HG,SG,CVG,CPG,IWG
    128 T = JT
        CASES FOR THE HOMOGENEOUS DOMAIN.
    130 IF(JT.GT.500) 131,132
    131 K = K+1  $  T = JT = JT + 10*K  $  IF(JT.GT.700) 300,132
    132 CALL GENEOUS $ V = 1/DEN  $  IW = W
    133 IF(P.LT.30) 134,135
    134 PRINT 18, T,DEN,V,DPDT,DPDD, E,H,S, CV,CP,IW  $  GO TO 150
    135 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S, CV,CP,IW
    150 CONTINUE
C
C     FOR P ABOVE PCRT, CASES FOR T.LT.OR.T.GT.TCRT.
    180 K=L=0  $  DO 250 J=1,99  $  T = JT = 10*(IT+J)
    181 IF(T.LT.TCRT) 192,210
C     CASE A FOR T LESS THAN TCRT.
    192 CALL COMPRLQ  $  V=1/DEN $ IW=W
    193 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW  $  GO TO 250
C     CASE FOR T ABOVE TCRT, HOMOGENEOUS DOMAIN.
    210 IF(JT.GT.500) 211,220
    211 K = K+1  $  T = JT = JT + 10*K  $  IF(JT.GT.700) 300,220
    220 CALL GENEOUS $ V = 1/DEN  $  IW = W
    221 PRINT 17, T,DEN,V,DPDT,DPDD, E,H,S,CV,CP,IW
    250 CONTINUE
    300 CONTINUE
    999 STOP    $    END




        SUBROUTINE COMPRLQ
C    GIVEN P,T FOR COMPR.LIQ. AT T.LT.TC, GET DEN AND FUNCTIONS.
        REVISED TO USE HSATF, SSATF, CSATXF, BUT NOT COEXIST. TIMESAVER.
        INTEGRATE ALONG ISOTHERM T FROM SATLIQ UP TO POINT (P,T).
        COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
        COMMON/5/ DDSDT
        COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
        COMMON/12/ DELS, DELCV
        DATA (TCRT=408.00)
      1 FORMAT(1H0 9X *T NOT UNDER TCRT IN COMPRLQ.*/)
      2 IF(T.GE.TCRT) 3,4
      3 PRINT 1    $    STOP
C     GET PSAT, DENLIQ, AND SATLIQ FUNCTIONS FOR START.
      4 PS = PSATF(T)  $  DL = DENLIQF(T)  $  DDLDT = DDSDT
      6 HS = HSATF(T)  $  ES = HS - 100*PS/DL  $  SS = SSATF(T)
      7 IF(T.GT.340) 8,9
      8 CVS = CVSATF(T)  $  GO TO 10
      9 PX=PVTF(T,DL,0)  $  CVS = CSATXF(T) + 100*T*DPDT*DDLDT/DL/DL
C     INTEGRATE UP TO POINT (P,T).
     10 DB = FINDENF(T,P)  $  DX = DB - DL  $  IF(DX.GT.0) 11,20
     11 N = DX*10 + 5  $  E = ES + EDELF(0,N,T,DL,DB)
     12 H = E + 100*P/DB  $  S = SS + DELS  $  CV = CVS + DELCV
     13 PX = PVTF(T,DB,1)  $  CP = CV + 100*T/DPDD*(DPDT/DB)**2
     14 W = SQRT(WK*CP*DPDD/CV)  $  DEN = DB  $    RETURN
     20 DEN=DL $ E=ES $ H=HS $ S=SS $ CV=CVS  $  PX = PVTF(T,DL,1)
     21 CP = CV + 100*T/DPDD*(DPDT/DL)**2  $  W = SQRT(WK*CP*DPDD/CV)
     30 RETURN  $  END              164
```

```
      SUBROUTINE COEXIST
C     GIVEN T AT COEXISTENCE, GET BOTH VAPOR AND LIQUID FUNCTIONS.
      FOR VAPOR, GET   DNG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD,  -
      FOR LIQUID, GET   DEN,E,H,S, CV,CP,CSAT,W. DPDT,DPDD.
C     COEXIST CALLED BY COMPRLQ. P NOT USED, MUST NOT CHANGE.
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/5/ DDSDT
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMCN/9/DNG,EG,HG,SG, CVG,CPG,WG, DPGDT,DPGDD
      COMMON/12/ DELS, DELCV
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA (Q=1.01325),(G=0.083145)
    1 FORMAT(1H0 9X *T EXCEEDS TCRT IN COEXIST. * / )
    2 IF(T.GT.TCRT) 3,4
    3 PRINT 1   $   STOP
    4 PS = PSATF(T)   $   DNG = DB = DENGASF(T)
    5 TI = T  $  CALL IDEAL  $  N = DB*20 + 10
    6 EG = EZZ + EZ + EDELF(1,N,T,0,DB)   $   HG = EG + 100*PS/DB
    7 SG = SZ + DELS - 100*G*ALOG(G*T*DB/Q)
    8 IF(T.EQ.TCRT) 9,11
    9 PX = PVTF(T,DB,1)   $  DPGDT = DPDT   $  DPGDD = DPDD
   10 CPG = CVG = WG = 0  $  GO TO 15
   11 CVG = CVZ + DELCV   $  PX = PVTF(T,DB,1)
   12 CPG = CVG + 100*T/DPDD*(DPDT/DB)**2   $  WG = SQRT(WK*CPG*DPDD/CVG)
   13 DPGDT = DPDT   $  DPGDD = DPDD
C     NOW TRAVERSE THE ,DDME, USING QVAP ,DATA,.
   15 DEN = CL = DENLIQF(T)   $  DDLDT = DDSDT   $  QV = QVAPXF(T)
   16 H = HG - QV   $  S = SG - QV/T    $    E = H - 100*PS/DL
   17 IF(T.EQ.TCRT) 18,19
   18 PX = PVTF(T,DL,1)   $  CP=CV=CSAT=W=0  $  RETURN
   19 CSAT = CSATXF(T)   $  PX = PVTF(T,DL,1)
   20 IF(T.GT.340) 21,22
   21 CV = CVSATF(T)   $   GO TO 23
   22 CV = CSAT + 100*T*DPDT*DDLDT/DL/DL
   23 CP = CV + 100*T/DPDD*(DPDT/DL)**2
   30 W = SQRT(WK*CP*DPDD/CV)    $    RETURN $  END




      FUNCTION CSATXF(T)
C     THIS CSATXF(T) VIA IBUTHRM, NOV. 1, 1978.  R.D.G.
      SSAT = SCRT + A*U**ES + B*LN(X) + C*U + D*U**2 + E*U**3,
      WHERE   X ≡ T/TCRT,  U ≡ (1-X).
C     CSAT = -ES*A*X/U**(1-ES) + B - C*X - 2*D*X*U - 3*E*X*U**2.
      DATA (ES=0.45),(TCRT=408.0),(A=-35.97387860),(B=87.70514205),
     1 (C=-45.80245863),(D=0.19432181),(E=15.98164931)
    1 FORMAT(1H0 9X 3HT =F10.5, * IN CSATXF(T). * / )
    2 IF(TCRT-T) 3,4,5
    3 PRINT 1, T   $   STOP
    4 CSATXF = 0   $   RETURN
    5 X = T/TCRT  $  U = 1.0 - X  $  XE = U**(1-ES)
    6 CSATXF = -ES*A*X/XE + B - C*X - 2*D*X*U - 3*E*X*U*U
    9 RETURN   $   END
```

```
      SUBROUTINE DASTHRM
C     COMPARE DAS/REED/EUBANK(1973) ON T = 440 K ISOTHERM  -   ISOBUTANE
C     GIVEN P,ATM, Z, -(H-HZ)CAL/MOL, -(S-SZ)CAL/MOL/K.
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA (CK=4.184),(R=0.083145)
    1 FORMAT(4F10.0)
    2 FORMAT(1H1 9X *COMPARISONS WITH DAS ET AL (1973) FOR ISOBUTANE AT
     1T = 440 K,*/10X*UNITS, BARS, MOLES, LITERS, JOULES, KELVINS. * //
     2 10X5HP,BAR 5X5HMOL/L 6X4HCALC 4X4HPCNT
     3 4X6H(H-HZ) 6X4HCALC 4X4HPCNT 4X6H(S-SZ) 6X4HCALC 4X4HPCNT )
    3 FORMAT(5X 3F10.3,F8.2, 2F10.1,F8.2, 2F10.3,F8.2)
   10 T = 440  $  PRINT 2  $  DO 20 J=1,30
   11 READ 1, PA, Z, HX, SX  $  IF(PA) 12,30
   12 P = 1.01325*PA  $  HX = -CK*HX  $  SX = -CK*SX  $  DX = P/Z/R/T
   13 CALL GENEOUS  $  DPCT = 100*(DX/DEN-1)
   14 H = H - EZZ - HZ  $   S = S - SZ
   15 HPCT =  100*(HX/H-1)  $  SPCT =  100*(SX/S-1)
   20 PRINT 3, P, DX,DEN,DPCT, HX,H,HPCT, SX,S,SPCT
   30 RETURN  $   END
```

```
      FUNCTION CVSATF(T)
C     ISOBUTANE CV ON SATLIQ BOUNDARY NEAR THE C.P.  NOV. 5, 1978.
      VALID ONLY FOR T NOT LESS THAN TZ = 340 K.
      CV = CVZ + A*X + B*X4/(1-X)**0.1,  X ≡ (T-TZ)/(TC-TZ).
      DATA (TZ=340.0),(TC=408.0),(TN=68.0)
      DATA (CVZ=111.87),(A=13.48),(B=5.38),(E=0.1)
    1 FORMAT(1H0 9X 3HT =F10.5, * IN CVSATF(T). * / )
    2 IF(T.LT.TZ.OR.T.GE.TC) 3,4
    3 PRINT 1, T    $   STOP
    4 X = (T-TZ)/TN  $  X2 = X*X   $  XE = (1-X)**E
    5 CVSATF = CVZ + A*X + B*X2*X2/XE   $    RETURN  $  END




      FUNCTION DENGASF(T)
C     FOR I-BUTANE, R.D.G., OCT. 23, 1978.
      VALID FOR TC=408.00, OC=3.86, PC=36.5488523 ONLY.
      DESIGNED FOR ZSAT = 1 AT LOW OENSITIES, 5/29/77.
C     USE ZSAT ≡ PS/DS/GK/TS WITH VAPOR PRESSURES, AND ZCRT.
C     Z = 1 + (ZCRT-1)*PI*F(X)/X/X.
C     F(X) = 1 + A1*VE + A2*V + A3*EXP(EGX*(1-1/V)).
C     NOTE ZSM1 FOR FUGACTY, NOT IN COMMON HEFE.
      COMMON/3/OPDT,D2PDT2,OPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/5/ DDSOT
      COMMCN/13/ ZCRT,ZSAT,OZSDT,ZFX, FRT,DFRTDT
      DIMENSION AV(3)
      DATA (OCRT=3.86),(TCRT=408.00),(PCRT=36.548852487)
      DATA (EG=0.35),(EGX=3.60),(GKK=0.083145)
      DATA(AV = -0.764051836, 0.650501182, 30.75066326)
    1 FORMAT(1H0 9X 3HT =F12.5, * IN OENGASF. * / )
    2 IF(TCRT-T) 3,4,5
    3 PRINT 1, T  $  STOP
    4 DENGASF = DCRT   $  DDSDT = 1.0E+10   $  RETURN
    5 ZN = ZCRT-1  $  FC = PCRT  $  P = PSATF(T)
    6 PI = P/PC  $   PIT = DPSDT/PC
    7 TC = TCRT   $   X = T/TC  $  X2 = X*X  $  V = 1-X  $  V1 = -1
    8 VE = V**EG  $  VE1 = -EG*VE/V
    9 EGXV = EGX*(1-1/V)   $   IF(EGXV.LT.-290) 10,11
   10 XP = XP1 = 0  $  GO TO 12
   11 XP = EXP(EGXV)   $  XP1 = -EGX*XP/V/V
   12 F = 1.0 + AV(1)*VE + AV(2)*V + AV(3)*XP
   13 F1 = AV(1)*VE1 - AV(2) + AV(3)*XP1  $   ZFX = F
   15 ZSM1 = ZN*PI*F/X2  $  ZSAT = Z = 1 + ZSM1
   16 DZSDT = DZDT = (PI*(F1-2*F/X)/TC + F*PIT)*ZN/X2
   17 OENGASF = P/T/Z/GKK
   18 DDSDT = (DPSOT - P/T - P*DZDT/Z)/T/Z/GKK  $  RETURN  $  END
```

167

```
      FUNCTION DENLIQF(T)
C     FOR I-BUTANE, RDG, OCT. 23, 1978.
      DEN = DCRT + YNL*(X + (XE-X)*Y),    YNL ≡ DTRP - DCRT.
      Y = A1 + A2*X2 + A3*X3.
      COMMON/5/ DDSDT
      DIMENSION AW(3)
      DATA (EL = 0.35)
      DATA (DCRT=3.86),(DTRP=12.755),(TTRP=113.55),(TCRT=408.00)
      DATA(AW = 0.786913448, -0.142753535, 0.057698164)
    1 FORMAT(1H0 9X *DENLIQF = 0, T EXCEEDS TCRT. * / )
    2 IF(TCRT-T) 3,4,5
    3 PRINT 1    $    STOP
    4 DENLIQF = DCRT   $   DDSDT = -1.0E+10   $   RETURN
    5 XN=TCRT-TTRP $ X=(TCRT-T)/XN $ X2 = X*X   $   DXDT = -1.0/XN
    6 XE = X**EL   $   V = XE - X   $   V1 = EL*XE/X - 1
    8 Y = AW(1) + AW(2)*X2 + AW(3)*X*X2   $   YNL = DTRP - DCRT
    9 Y1 = 2*AW(2)*X + 3*AW(3)*X2
   11 DENLIQF = DCRT + YNL*(X + V*Y)
   12 DDSDT = YNL*(1 + V*Y1 + V1*Y)*DXDT    $    RETURN  $  END



      FUNCTION EDELF(L,N,T,DA,DB)
C     SPECIAL REVISION FOR VERY LOW DENSITIES.
      GET CHANGE OF E, S, CV WITH DENSITY ALONG ISOTHERMS.
      GET EDELF, DELS, DELCV FROM DA TO DB ON ISOTHERM T.
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT, DPMDT, DPDD,DPDR,DTSDR,DTHDR
      COMMON/12/ DELS, DELCV
      COMMON/13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
      DATA (G = 0.083145)
    1 ZK = 1.0 - 1/ZCRT   $   RK = G*TCRT/DCRT   $   E = S = CV = 0
    2 DX = (DB-DA)/N    $    IF(DX) 3,30
    3 DO 15 J=1,N   $   DN = DA + (J-0.5)*DX
    4 DXN = DX/DN/DN   $   P = PVTF(T,DN,0)   $   CV = CV - D2PDT2*DXN
    5 IF(DN.LT.DCRT) 7,9
    7 E = E + (ZK*ZSAT*ZFX + FRT - T*DFRTDT)*RK*DX   $   GO TO 10
    9 E = E + (P - T*DPDT)*DXN
   10 IF(L.EQ.0) 11,12
   11 S = S - DPDT*DXN    $    GO TO 15
   12 S = S + (G - DPDT/DN)*DX/DN
   15 CONTINUE
   16 EDELF = 100*E   $   DELS = 100*S   $   DELCV = 100*T*CV   $   RETURN
   30 EDELF = DELS = DELCV = 0    $    RETURN  $  END
```

```
      FUNCTION FINDENF(T,P)
C     ON ISOTHERM T, FIND DEN, MOL/L, TO MINIMIZE (P-PC) VIA EQNSTATE.
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      DATA (DM=13.5),(GKK=0.083145)
   41 FORMAT(1H0 9X *FINDENF = 0,   FAILS TO CONVERGE. * / )
   42 FORMAT(1H0 9X *FINDENF = DCRT, DP/DR ZERO OR NEG. * / )
   43 FORMAT(1H0 9X *FINDENF = 0, DOUBLE-VALUED AT P = PSAT. * / )
      IF(P.GT.0) 1,35
    1 IF(T-TCRT) 2,5,8
    2 DG=DENGASF(T) $ DL=DENLIQF(T) $ PS=PSATF(T)   $  IF(P-PS) 3,32,4
    3 D = DG/2  $   GO TO 11
    4 D = (DL+DTRP)/2  $  GO TO 11
    5 DG=DL=DCRT  $  PS=PCRT  $  IF(P-PS) 6,33,7
    6 D = DCRT/2  $  GO TO 11
    7 D = 2*DCRT  $  GO TO 11
    8 IF(T.LT.450.0) 9,10
    9 PC = PVTF(T,DCRT,D)   $  IF(P-PC) 6,33,7
   10 D = DCRT
   11 DO 30 J=1,50 $ DP=P-PVTF(T,D,1) $ IF(ABS (DP/P)-1.0E-6) 31,31,12
   12 IF(DPDD.GT.0) 13,34
   13 DD = DP/DPDD  $  IF(ABS (DD/D)-1.0E-6) 31,31,14
   14 D = D + DD   $   IF(D.GT.0.0) 16,15
   15 D = P/GKK/T  $   GO TO 30
   16 IF(D.GT.DM) 17,18
   17 D = DM  $  GO TO 30
   18 IF(T-TCRT) 19,24,30
   19 IF(P.LT.PS) 20,22
   20 IF(D.GT.DG) 21,30
   21 D = DG  $  GO TO 30
   22 IF(D.LT.DL) 23,30
   23 D = DL  $  GO TO 30
   24 IF(P.LT.PCRT) 25,27
   25 IF(D.LT.DCRT) 30,26
   26 D = DCRT - 0.02  $  GO TO 30
   27 IF(D.GT.DCRT) 30,28
   28 D = DCRT + 0.02
   30 CONTINUE  $  PRINT 41  $   STOP
   31 FINDENF = D    $   RETURN
   32 PRINT 43  $   STOP
   33 FINDENF = DCRT  $  RETURN
   34 FINDENF = DCRT   $  PRINT 42   $   RETURN
   35 FINDENF=DPDT=D2PDT2=0   $   DPDD=GKK*T   $   DPDR=DPDD*DTRP
   36 RETURN   $   END



      FUNCTION FINDTMF(P)
C     GIVEN P ON THE MELTING LINE, FIND T FOR I-BUTANE.
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      DATA (A=430.0),(E=6.08)
    1 X = (P-PTRP)/A + 1  $  FINDTMF = TTRP*X**(1.0/E)  $  RETURN $ END
```

169

```
      FUNCTION FINDTSF(P)
C   GIVEN VAPOR PRESSURE P, ITERATE T TO MINIMIZE (P-PC).
      COMMCN/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,OTRP,TTRP,PTRP
      COMMCN/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
    1 FORMAT(1H0 9X *FINDTSF = 0,  FAILS TO CONVERGE. * / )
    2 FORMAT(1H0 9X *FINDTSF = 0,  P EXCEEDS PCRT. * / )
    3 IF(P-PCRT) 4,11,12
    4 T = 300  $  DO 9 J=1,50  $  DP = P - PSATF(T)  $  ADP = ABS (DP)
    5 IF(ADP/P-1.0E-6) 10,6,6
    6 IF(ADP/DPSDT/T-1.0E-6) 10,7,7
    7 T = T + DP/DPSDT  $  IF(T-TCRT) 9,9,8
    8 T = TCRT
    9 CONTINUE  $  PRINT 1  $  STOP
   10 FINDTSF = T   $   RETURN
   11 FINDTSF = TCRT   $   RETURN
   12 PRINT 2  $  STOP  $  END



      SUBROUTINE GENEOUS
C   GIVEN P,T FOR THE HOMOGENEOUS DOMAIN -
      GET DEN AND FUNCTIONS AT ANY TEMPERATURE.
      COMMCN/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMCN/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMCN/12/ DELS, DELCV
      COMMCN/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DATA (Q=1.01325),(G=0.083145)
    3 TI = T  $  CALL IDEAL  $  IF(P.GT.0) 4,10
    4 DEN = DB = FINDENF(T,P)  $  N = DB*20 + 10
    5 E = EZZ + EZ + EDELF(1,N,T,0,DB)  $  H = E + 100*P/DB
    6 S = SZ + DELS - 100*G*ALOG(G*T*DB/Q)
    7 CV = CVZ + DELCV  $  PX = PVTF(T,DB,1)
    8 CP = CV + 100*T/DPDD*(DPDT/DB)**2
    9 W = SORT(WK*CP*DPDD/CV)  $  RETURN
   10 DEN=S=0  $  E = EZZ + EZ  $  H = E + 100*G*T  $  CV=CVZ $ CP=CPZ
   12 W = SORT(WK*CP*G*T/CV)  $  RETURN  $  END



      FUNCTION HSATF(T)
C   I-BUTANE SATLIQ ENTHALPY, J/MOL.
C   THIS HSATF(T) VIA IBUTHRM, NOV. 1, 1978.  R.D.G.
      FOR 30 POINTS, 120 THRU 408 K, RMSPCT = 0.027.
C   DEFINE YH ≡ (H-HC)/(HT-HC),  X ≡ (TC-T)/(TC-TT),  WHEN -
C   YH = X + (XE-X)*(A1 + A2*X + A3*X2 + . . .)
      DIMENSION AH(3)
      DATA (TTRP=113.55),(TCRT=408.00)
      DATA (NFH=3),(EH=0.5),(HTRP=0.0),(HCRT=43739.182)
      DATA(AH = 0.4016094798, 0.4044226707, -0.1374834999)
    1 FORMAT(1H0 9X 3HT =F10.5, * IN HSATF(T).*/)
    2 IF(T.GT.TCRT) 3,4
    3 PRINT 1, T  $  STOP
    4 X = (TCRT-T)/(TCRT-TTRP)  $  IF(X.LE.0) 5,6
    5 HSATF = HCRT   $   RETURN
    6 V = X**EH - X  $  FX = X  $  DO 7 K=1,NFH
    7 FX = FX + V*AH(K)*X**(K-1)
    8 HSATF = HCRT - (HCRT-HTRP)*FX  $  RETURN  $  END
```

170

```
      SUBROUTINE IDEAL
C   I-BUTANE, VIA DATA OF CHEN ET AL (1975).
      CPZ/R = 4 + (A1 + A2/X + A3/X2 + . . )*EXP(-E/X),   X ≡ T/100.
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION A(7)
      DATA (E=6.40),(R=8.3145),(HI=7.26243166),(SI=35.59759)
      DATA(A = 43.59076, -40.54350, 739.72837, -3137.57293,
     1 7742.58382, -7583.91994, 3251.25208)
    1 NK = 7   $  XI = TI/100  $  XP = EXP(-E/XI)
    2 CP = 4.0   $   DO 3 K=1,NK
    3 CP = CP + A(K)*XP*XI**(1-K)
C   NUMERICAL INTEGRATION FOR HZ/R, SZ/R  -
    5 H = S = 0   $  N = ABS(TI-300)/4 + 4   $   DX = (XI-3)/N
    6 DO 10 J=1,N   $  X = 3.0 + (J-0.5)*DX   $  XP = EXP(-E/X)
    7 CPX = 4.0   $   DO 8 K=1,NK
    8 CPX = CPX + A(K)*XP*X**(1-K)
    9 H = H + CPX*DX    $   S = S + CPX*DX/X
   10 CONTINUE   $  H = (HI*3 + H)/XI  $  S = SI + S
C    CONVERT TO JOULES, MOLES, KELVINS.
   11 HZ = R*TI*H   $  EZ = HZ - R*TI  $  SZ = R*S
   12 CPZ = R*CP   $  CVZ = CPZ - R   $   RETURN  $  END



      SUBROUTINE ISOTHRM
C    PRINTOUT THE CRITICAL ISOTHERM.
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
      COMMON/6/ TSAT, THETA, PSAT
    1 FORMAT(1H1 14X *THE CRITICAL ISOTHERM, ISOBUTANE * //
     1 6X4HTC =F7.2, 6H, DC =F5.2, 6H, PC =F11.7,
     2 *. AT THE C.P., DPS/DT =* F8.5, 9H, DP/DT =F8.5//
     3 6X4HD/DC 9X5HTS/TC 9X5HPS/PC 10X4HP/PC 9X5HDP/DR 4X6HDTS/DR
     4 4X6HDTH/DR 4X6HDPS/DR 4X6HDXB/DR 4X6HDXC/DR )
    2 FORMAT(2X F8.2, 3F14.10, F14.9, 5F10.5)
    3 PC = PVTF(TCRT,DCRT,0)
    4 PRINT 1, TCRT,DCRT,PCRT, DPSDT,DPDT    $    DO 8 J=1,31
    5 DR = 0.84 + 0.01*J   $  DN = DR*DCRT
    6 PR = PVTF(TCRT,DN,1)/PCRT   $   DPSDR = DPSDT*DTSDR
    7 TSN = TSAT/TCRT   $  PSN = PSAT/PCRT
    8 PRINT 2, DR, TSN,PSN, PR,DPDR, DTSDR,DTHDR,DPSDR, DXBDR,DXEDR
    9 RETURN   $   END



      FUNCTION PMELTF(T)
C   I-BUTANE MELT-LINE.  REEVES, SCOTT, AND BABB(JR),
C   J. CHEM. PHYS. 40(12), 3662 (1964).
C   PRIVATE COM. VIA S.E.BABB,JR., OCT. 2, 1978.
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      DATA (A=430.0),(E=6.08)
    1 X = T/TTRP   $  XE = X**E   $  PMELTF = PTRP + A*(XE-1)
    2 DPMDT = A*E*XE/X/TTRP    $   RETURN  $  END
```

171

```
      SUBROUTINE JTLOCUS
C     DERIVE THE J-T INVERSION CURVE.  USE ROUTINE DELTAF(T,DI).
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      DIMENSION TT(99),PP(99),DN(99)
      DATA (A=2.60),(B=0.58),(TZ=500.0)
    1 FORMAT(1H1 16X *THE JOULE-THOMSON INVERSION LOCUS FOR  I-BUTANE*//
    1 17X3HT,K 5X5HP,BAR 5X5HMOL/L  7X3HT,K 5X5HP,BAR 5X5HMOL/L)
    2 FORMAT(10X I10, F10.1, F10.2,  I10, F10.1, F10.2)
    5 TA = 340    $   NP = 52
    6 PRINT 1   $   DO 25 I=1,NP   $   DX = 1.6
    7 T = TA + 10*I   $   U = T/TZ   $   OI = EXP(A-B*U)
   10 IF(T-TCRT) 11,12,12
   11 DL = DENLIQF(T)   $   IF(DI-DL) 25,12,12
   12 SS = DELTAF(T,DI)   $   DO 20 IT=1,20
   14 D=DI-DX $ SL=DELTAF(T,D)   $   D=DI+DX $ SP=DELTAF(T,D)
   15 IF(SS-SL) 18,16,16
   16 IF(SP-SL) 19,17,17
   17 SS : SL   $   DI = DI - DX   $   GO TO 20
   18 IF(SS-SP) 20,20,19
   19 SS = SP   $   OI = DI + DX
   20 DX = DX/2
   23 TT( ) = T   $   DN(I) = DI   $   PP(I) = PVTF(T,DI,0)
   25 CONTINUE   $   N = NP/2   $   DO 29 J=1,N
   26 IT = TT(J)   $   ITT = TT(J+N)
   29 PRINT 2, IT, FP(J), ON(J), ITT, PP(J+N), DN(J+N)
   30 RETURN   $   END




      FUNCTION DELTAF(T,D)
C     GET (T*DP/DT - D*DP/DD) FOR THE J-T INVERSION CURVE.
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,OPMOT,DPDD,DPOR,DTSDR,DTHDR
    1 IF(T-TCRT) 2,4,4
    2 DL = DENLIQF(T)   $   IF(D-DL) 3,3,4
    3 DELTAF = 1.0E+100   $   RETURN
    4 P = PVTF(T,D,1)
    5 OELTAF = ABS (T*DPDT-O*DPDD)   $   RETURN   $   END
```

172

```
      SUBROUTINE PEEK
C     EXAMINE BEHAVIOR OF THE COEFFICIENTS.
      B(S) ≡ B1 + B2*EXP(BE*S),  E(S) ≡ E1*(S-1)*(S-ER)*EXP(-GA*S**IX).
      WHERE,   R ≡ DEN/DTRP,  S ≡ DEN/DCRT.
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER, IX
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/6/ TSAT, THETA, PSAT
    4 FORMAT(1H1 14X *EQNSTATE COEFFICIENTS, ISOBUTANE * //
    1 15X 6HDGAT =E15.9/
    2 15X 6HDTRP =F8.4, 8H, TTRP =F8.3, 8H, PTRP =E16.9/
    3 15X 6HDCRT =F8.4, 8H, TCRT =F8.3, 8H, PCRT =F13.9//
    4 15X 4HAL =F6.3, 6H, BE =F6.3, 6H, GA =F6.3/
    5 15X 4HDE =F6.3, 6H, EP =F6.3, 6H, ER =F6.3, 6H, IX =I3//
    6 13X 4F16.11/ 13X F16.11/)
    5 FORMAT(15X 5HMOL/L 6X4HTSAT 5X5HTHETA 6X4HPSAT 9X1HB 9X1HC )
    6 FORMAT(10X F10.1, 3F10.3, F10.4, F10.5)
   10 PRINT 4, DGAT, DTRP,TTRP,PTRP, DCRT,TCRT,PCRT,
    1 AL,BE,GA,DE,EP, ER,IX, B1,B2,B3,B4, E1
   11 PRINT 5    $    DO 20 J=1,25  $  DN = 0.5*J
   12 R = DN/DTRP  $  S = DN/DCRT  $  SN = S-1  $  IF(ER) 13,14
   13 SR = S - ER  $  GO TO 15
   14 SR = 1
   15 S2 = S*S  $  S3 = S*S2  $  SX = S**IX
   16 B = B1 + B2*EXP(BE*S)
   18 E = E1*SN*SR*EXP(-GA*SX)
   19 TSAT=TS=TSATF(DN)   $  TH=THETAF(DN)   $  PS=PSATF(TS)
   20 PRINT 6, DN, TS,TH,PS, B,E   $   RETURN  $  END




      FUNCTION PSATF(T)
C     I-BUTANE VAPOR PRESSURES, BAR.  RDG, OCT. 23, 1978.
      LN(P) = A + B*U + C*X + D*X2 + E*X3 + F*X*(1-X)**EPP.
      WHERE,   X ≡ T/TCRT,  U ≡ (1-1/X).
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      DATA(EPP=1.95),(TCRT=408.0),(A=13.80835297),(B=9.37269200),
    1 (C=-70.54663008),(D=112.75833458),(E=-52.42140768),
    2 (F=47.81122198)
    1 FORMAT(1H0 9X *T ABOVE TCRT IN PSATF(T). * / )
    2 X = T/TCRT  $  X2 = X*X  $  X1T = 1.0/TCRT
    3 U = 1.0 - 1/X  $  U1T = 1.0/X/T
    4 V = 1.0 - X  $  IF(V) 7,8,9
    7 PRINT 1    $    STOP
    8 Z = Z1 = 0  $  GO TO 10
    9 Z = V**EPP  $  Z1 = -EPP*Z/V
   10 CONTINUE
   12 PL = A + B*U + C*X + D*X2 + E*X*X2 + F*X*Z
   13 PL1T = B*U1T + (C + 2*D*X + 3*E*X2 + F*(X*Z1 + Z))*X1T
   15 PSATF = EXP(PL)  $  DPSDT = PL1T*PSATF   $   RETURN  $  END
```

173

```
      SUBROUTINE PRINTIT
C     PRINTOUT ISOCHORES AND ISOTHERMS.
      COMMON/1/AL,BE,GA,OE,EP, OCRT,TCRT,PCRT, DGAT,OTRP,TTRP,PTRP
      COMMON/3/DPOT,D2PDT2,OPSDT,DPMDT,OPDD,DFDR,DTSDR,DTHDR
    1 FORMAT(I5, 2F10.0)
    5 FORMAT(1X)
    6 FORMAT(1H1 16X *ISOBUTANE ISOCHORE AT* F7.3, * MOL/L* //
    1 17X 3HT,K 5X5HP,BAR 5X5HDP/DD 5X5HDP/DT 4X7H02P/DT2)
    7 FORMAT(10X F10.3, 2F10.3, F10.4, F11.5)
    8 FORMAT(1H1 14X *ISOBUTANE ISOTHERM AT* F7.2, * DEG. K* //
    1 10X 5HMOL/L 5X5HP,BAR 5X5HDP/DD 5X5HDP/DT 5X7H02P/DT2 )
    9 FORMAT(5X F10.3, 2F10.3, F10.4, F12.6)
C     PRINTOUT THE ISOCHORES.
   20 DO 60 I=1,15   $ IF(I.EQ.1) 21,22
   21 ON = 0.5  $  GO TO 30
   22 IF(I.EQ.5) 23,24
   23 DN = OCRT  $  GO TO 30
   24 IF(I.EQ.15) 25,26
   25 DN = OTRP  $  GO TO 30
   26 IF(I.LT.5) 27,28
   27 ON = I - 1  $  GO TO 30
   28 DN = I - 2
   30 PRINT 6, ON   $ TS = TSATF(ON)  $  PS = PVTF(TS,ON,1)
   31 PRINT 7, TS, PS, DPOD, DPOT, O2PDT2
   40 IF(I.LT.10) 41,42
   41 IT = 8  $  GO TO 50
   42 IF(I.LT.12) 43,44
   43 IT = 4  $  GO TO 50
   44 IF(I.LT.14) 45,46
   45 IT = 2  $  GO TO 50
   46 IT = 1
   50 DO 59 J=114,700,IT  $  TT = J  $  IF(TT-TS) 59,59,52
   52 PP = PVTF(TT,DN,1)  $  IF(PP.GT.720) 60,58
   58 PRINT 7, TT,PP, DPOD, OPDT, D2PDT2
   59 CONTINUE
   60 CONTINUE
C     PRINTOUT THE ISOTHERMS.
  100 DO 130 I=1,99  $  READ 1, IDO, TT,DX  $  IF(IOD) 101,999
  101 PRINT 8, TT  $  PM = PMELTF(TT)
  102 IF(TT-TCRT) 103,103,104
  103 DG = DENGASF(TT)  $  DL = OENLIQF(TT)
  104 L = 0  $  OS = DX
  110 DO 120 N=1,1500  $  DN = N*OS  $  IF(TT-TCRT) 111,111,117
  111 IF(ON.GE.DG.AND.ON.LE.DL) 112,117
  112 L = L + 1  $  IF(L.EQ.1) 113,120
  113 PG=PVTF(TT,CG,1)  $  PRINT 9, OG,PG,OPDO,OPDT,D2PDT2
  114 PRINT 5
  115 PL=PVTF(TT,DL,1)  $  PRINT 9, OL,PL,OPOO,DPDT,O2PDT2
  116 GO TO 120
  117 PP = PVTF(TT,DN,1)  $  IF(PP.GT.PM.OR.PP.GT.720) 130,119
  119 PRINT 9, ON,PP, OPOD, DPDT, O2PDT2
  120 CONTINUE
  130 CONTINUE
  999 RETURN   $   END
```

174

```
      SUBROUTINE PVTDATA
C    I-BUTANE EQNS1ATE, OCT. 23, 1978, AT 10.29.
C    NEW XEF, DENGASF, EDELF, FOR LOW DENSITIES.
C    P - PSAT = S*GK*(T-TSAT) + S*S*GK*TCRT*F(S,T),
C    F(S,T) ≡ B(S)*XBF(S,T) + E(S)*XEF(S,T)   W ≡ (1-TH/T),
C    XBF(S,T) ≡ SQRT(X)*LN(T/TSAT),   XEF(S,T) ≡ PSI - PSISAT, WHERE -
C    PSI(S,T) ≡ DE*EXP(EP*(1-X)) + (1-DE)*(1 - W + W*LN(W)).
C    B(S) = B1 + B2*EXP(BE*S),   R ≡ DEN/DTRP,   S ≡ DEN/DCRT.
C    E(S) ≡ E1*(S-1)*EXP(-GA*S**IX)
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER, IX
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
   17 WM = 58.1243  $   Q = 1.01325  $  QP = Q/14.69595  $  EPP = 1.95
   18 TTRP=113.55   $  DTRP=12.755  $  PTRP=PSATF(TTRP)
   19 TCRT=408.00   $  DCRT=3.86   $   PCRT=PSATF(TCRT)
   20 GKK = 0.083145  $  GK = GKK*DCRT   $  ZCRT = PCRT/DCRT/GKK/TCRT
   21 IX=4 $ AL=1 $ BE=0.50 $ GA=0.30 $ DE=2./3. $ EP=3 $ ER=0
   22 B1=-0.05165511088 $ B2=0.62315236106 $ B3=B4=0 $ E1=0.42083144154
   23 DGAT = DENGASF(TTRP)  $  CALL PEEK  $  CALL ISOTHRM
   24 WK = 100000/WM    $   EZZ = 23838.616
C    GET BOILING POINT TEMP., VAP. AND LIQ. DENSITIES.
   50 FORMAT(1H1 9X *BOILING POINT, I-BUTANE * //
    1 10X4HTB =F10.5/ 10X4HDG =F10.7/ 10X4HDL =F10.5)
   51 TBP = FINDTSF(1.01325) $ DGB=DENGASF(TBP) $ DLB=DENLIQF(TBP)
   52 PRINT 50, TBP, DGB, DLB
   99 RETURN   $   END




      FUNCTION QVAPXF(T)
C    I-BUTANE, OCT. 27, 1978.   R.D.G.
C    FOR 129 WEIGHTED DATA (INCL. CLAPEYRON), RMS = 0.54 PCNT.
C    QVAP/QTRP = X + (XE-X)*(A + B*X2 + C*X3),   WHERE -
C    X ≡ (TC-T)/(TC-TT),    XE ≡ X**E.
      DATA(E=0.45),(QT=28.203),(TTRP=113.55),(TCRT=408.0),(XN=294.45)
      DATA (A=1.1726829),(B=-0.23924905),(C=-0.0265020)
    1 FORMAT(1H0 9X *T EXCEEDS TCRT IN QVAPXF(T). * / )
    2 IF(TCRT-T) 3,4,5
    3 PRINT 1    $    STOP
    4 QVAPXF = 0  $  RETURN
    5 X = (TCRT-T)/XN  $  X2 = X*X   $  XE = X**E
    6 Q = QT*(X + (XE-X)*(A + B*X2 + C*X*X2))
    7 QVAPXF = Q*1000   $   RETURN  $  END
```
175

```
      FUNCTION PVTF(T,D,M)
C     I-BUTANE EQNSTATE, PVTF ≡ P,BAR.
C     NOTE, M=0 RETURNS DP/DT, D2P/DT2.  M=1 RETURNS ALSO DP/DD.
C     P-PSAT = S*GK*(T-TSAT) + S*S*GK*TCRT*F(S,T),   WHERE -
C     F(S,T) ≡ B(S)*XBF(S,T) + E(S)*XEF(S,T),   AND -
C     B(S) ≡ B1 + B2*EXP(BE*S),  E(S) ≡ E1*(S-1)*(S-ER)*EXP(-GA*S**IX).
C     WHERE,   R ≡ DEN/DTRP,  S ≡ DEN/DCRT.
      COMMON GK,GKK, B1,B2,B3,B4, E1,ER, IX
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
      COMMON/6/ TSAT, THETA, PSAT
      COMMON/13/ ZCRT,ZSAT,DZSDT,ZFX, FRT,DFRTDT
    1 R = D/DTRP  $  S = D/DCRT  $  SN = S-1  $  IF(ER) 2,3
    2 SR = S - ER  $  SR1 = 1  $  GO TO 4
    3 SR = 1  $  SR1 = 0
    4 S2 = S*S  $  S3 = S*S2  $  SX = S**IX
    5 GK = DCRT*GKK  $  TC = TCRT  $  DSDR = DTRP/DCRT
    6 RG = S*GK  $  GKT = GK*TC
    7 TSAT=TS=TSATF(D)  $  PSAT=PS=PSATF(TS)  $  THETA=THETAF(D)
    8 XB = XBF(T,D)  $  XE = XEF(T,D)
    9 XPB = EXP(BE*S)  $  B = B1*S2 + B2*S2*XPB
   10 XP = EXP(-GA*SX)  $  SM = SN*SR*S2  $  E = E1*SM*XP
   12 F = B*XB + E*XE  $  F1 = B*XB1 + E*XE1  $  F2 = B*XB2 + E*XE2
   13 PVTF = PS + RG*(T-TS) + GKT*F  $  FRT=F/S2  $  DFRTDT=F1/S2/TC
   14 DPDT = RG + GK*F1  $  D2PDT2 = GK*F2/TC  $  IF(M) 15,30
   15 BD = (2*B1*S + B2*(BE*S2 + 2*S)*XPB)*DSDR
   16 SM1 = SR*S2 + SN*SR1*S2 + SN*SR*2*S  $  XP1 = -IX*GA*SX/S
   17 ED = E1*(SM*XP1 + SM1)*XP*DSDR
   20 F1 = B*DXBDR + BD*XB  +  E*DXEDR + ED*XE
   26 DPDR = (DPSDT-RG)*DTSDR + (T-TS)*GK*DSDR + GKT*F1
   27 DPDD = DPDR/DTRP
   30 RETURN  $  END




      FUNCTION SSATF(T)
C     I-BUTANE SATLIQ ENTROPY, J/MOL/K.
C     THIS SSATF(T) VIA IBUTHRM, NOV. 1, 1978.  R.D.G.
C     FOR 31 POINTS, TTRP THRU TCRT, RMSPCT = 0.003.
C     SSAT - SCRT = A1*U**ES + A2*LN(X) + A3*U + A4*U2 + A5*U3,  WHERE -
C     X ≡ T/TCRT,  U ≡ (1-X).
      COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      DIMENSION AS(5)
      DATA (NFS=5),(ES=0.45),(TCRT=408.0),(SCRT=278.44576)
      DATA(AS = -35.97387860, 87.70514205,
     1 -45.80245863, 0.19432181, 15.98164931)
    1 FORMAT(1H0 9X 3HT =F10.5, * IN SSATF(T). * / )
    2 IF(T.GT.TCRT) 3,4
    3 PRINT 1, T  $  STOP
    4 X = T/TCRT  $  U = 1.0 - X  $  IF(U.LE.0) 5,6
    5 SSATF = SCRT  $  RETURN
    6 SSATF = SCRT + AS(1)*U**ES + AS(2)*ALOG(X)  $  DO 7 K=3,NFS
    7 SSATF = SSATF + AS(K)*U**(K-2)  $  RETURN  $  END
```

```
      SUBROUTINE SAGECP
C    COMPARE CP ISOBUTANE,SAGE/LACEY WITH OUR CALCD. RESULTS.
C    THEIR DATA FOR HOMOGENEOUS DOMAIN IN BTU/LB/F, PSI, T,F.
C    CPK = 1054.35/453.5924*MW*1.8.
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      DIMENSION TB(7),CB(7), TK(99),PA(99),CPJ(99)
      DATA (PK = 14.503775),(CPK = 243.192)
    1 FORMAT(10X 7F10.0)
    2 FORMAT( 8F10.0 )
    3 FORMAT(1H116X*COMPARISON WITH ISOBUTANE CP OF SAGE/LACEY * //
     1 17X 3HT,K 5X5HP,BAR 5X5HMOL/L 3X7HJ/MOL/K 6X4HCALC 6X4HPCNT )
    4 FORMAT(10X 2F10.3, F10.4, 3F10.2)
    5 FORMAT(1H0 12X 4HNP =I3, 10H, RMSPCT =F6.2)
   10 READ 1, (TB(J),J=1,7)  $  DO 11 J=1,7
   11 TB(J) = (TB(J)+459.67)/1.8   $   N = 0
   12 DO 19 I=1,20   $  READ 2, PSI, (CB(J),J=1,7)
   13 IF(PSI.LT.400) 14,20
   14 DO 19 J=1,7   $   IF(CB(J)) 15,19
   15 N = N + 1   $   TK(N) = TB(J)   $   PA(N) = PSI/PK
   16 CPJ(N) = CB(J)*CPK
   19 CONTINUE
   20 NP = N   $   PRINT 3   $   SS = 0
   22 DO 30 J=1,NP   $   T=TK(J)  $  P=PA(J)  $  CALL GENEOUS
   24 DIF = CPJ(J)-CP   $   PCT = 100*DIF/CP   $   SS = SS + PCT*PCT
   25 IF(J.EQ.34)   PRINT 3
   30 PRINT 4, T,P,DEN, CPJ(J),CP, PCT
   31 SS = SQRT(SS/NP)   $   PRINT 5, NP, SS   $   RETURN   $   END


      SUBROUTINE SAGTHRM
C    COMPARE SAGE/LACEY ISOBUTANE DEN, DEL-H, DEL-S AT T = 250 F.
C    PK Ξ 14.69595/1.01325,  DK = 453.5924/28.31685/58.1243,
C    HK = 1054.35*58.1243/453.5924,  SK Ξ 1.8*HK
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      DIMENSION PX(30), DX(30), HX(30), SX(30)
      DATA (PK=14.503775),(DK=0.275590),(HK=135.1067),(SK=243.1920)
    1 FORMAT(4F10.0)
    2 FORMAT(1H1 9X *COMPARISONS WITH ISOBUTANE FUNCTIONS OF SAGE/LACEY
     1AT T = 250 F,*/10X*UNITS, BARS, MOLES, LITERS, JOULES, KELVINS,  T
     1 = 394.261 K. * //
     2 10X 5HP,BAR 5X5HMOL/L 6X4HCALC 4X4HPCNT
     3 4X(H(H-H1) 6X4HCALC 4X4HPCNT 4X6H(S-S1) 6X4HCALC 4X4HPCNT )
    3 FORMAT(5X 3F10.3,F8.2, 2F10.1,F8.2, 2F10.3,F8.2)
    9 T = (250+459.67)/1.8   $   DO 14 J=1,30
   10 READ 1, PSI, V, HA, SA   $   IF(FSI) 11,15
   11 PX(J) = PSI/PK   $   DX(J) = DK/V
   12 HX(J) = HK*HA   $   SX(J) = SK*SA
   14 CONTINUE
   15 NP = J-1   $   HX1 = HX(1)   $   SX1 = SX(1)   $   PS = PSATF(T)
   16 P = PX(1)   $   CALL GENEOUS   $   H1 = H   $   S1 = S   $   PRINT 2
   20 DO 40 J=1,NP   $   P = PX(J)
   21 HX(J) = HX(J) - HX1   $   SX(J) = SX(J) - SX1
   22 IF(P.LT.PS) 23,24
   23 CALL GENEOUS   $   GO TO 25
   24 CALL COMPRLQ
   25 H = H - H1   $   S = S - S1   $   DPCT = 100*(DX(J)/OEN-1)
   26 IF(J.EQ.1) 27,28
   27 HPCT = SPCT = 0   $   GO TO 40
   28 HPCT = 100*(HX(J)/H-1)   $   SPCT = 100*(SX(J)/S-1)
   40 PRINT 3, P, DX(J),DEN,DPCT, HX(J),H,HPCT, SX(J),S,SPCT
   90 RETURN   $   END                177
```

```
      SUBROUTINE STAREQN
C     STARLING ISOBUTANE EQNSTATE, RPT. ORO-5249-2, DEC. 31, 1977.
C     DATA FOR EQNSTATE IN BRITISH UNITS -
C     BRITISH UNITS,  PSI, T,DEG.R, LB-MOL/CUFT. MW = 58.12, GK = 10.7315
C     MY (G-MOL/L)*(28.31685/453.5924)*(58.1243/58.12) = LB-MOL/CUFT.
C     HENCE,  (G-MOL/L)*(0.062432583) = LB-MOL/CUFT.
C     PSI = (P,BAR)*(14.69595/1.01325) = (P,BAR)*14.503775.
C     (100*DK/PK)*(PSI-CUFT/LBMOL) = JOULE/G-MOL.
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      DATA (GK=10.7315),(DK=0.062432583),(PK=14.503775)
      DATA (BZ=2.026152731),(AZ=38980.2015),(CZ=106.58145088E+8),
     1 (GA=9.213784536),(B=6.707625908),(A=38864.3892),(AL=6.877265605),
     2 (C=328.2196701E+8),(DZ=147.0459327E+10),(D=618.3034445E+4),
     3 (EZ=8981.524117E+10)
C     CONVERT MY (T,DEN) INTO RANKINE, AND LB-MOL/CUFT.
   19 DB = DK*DEN  $  DB2=DB*DB  $  DB3=DB*DB2
   20 TR = 1.8*T  $  TR2=TR*TR  $  TR3=TR*TR2  $  TR4=TR2*TR2
   21 F1 = D3*GK*TR
   22 F2 = BZ*GK*TR - AZ - CZ/TR2 + DZ/TR3 - EZ/TR4  $  F2 = F2*DB2
   23 F3 = (9*GK*TR - A - D/TR)*DB3
   24 F4 = AL*(A + D/TR)*DB3*DB3  $   XP = EXP(-GA*DB2)
   25 F5 = C*DB3/TR2*(1 + GA*DB2)*XP
   29 PSI = F1 + F2 + F3 + F4 + F5  $   P = PSI/PK
C    GET DP/DT, THEN CONVERT TO SI UNITS.
   31 F1T = DB*GK
   32 F2T = (BZ*GK + 2*CZ/TR3 - 3*DZ/TR4 + 4*EZ/TR/TR4)*DB2
   33 F3T = (B*GK + D/TR2)*DB3
   34 F4T = -AL*D*DB3*DB3/TR2
   35 F5T = -2*C*DB3/TR3*(1+GA*DB2)*XP
   36 DPDT = (1.8/PK)*(F1T + F2T + F3T + F4T + F5T)
C    GET D2P/DT2, THEN CONVERT TO SI UNITS.
   42 F2T2 = (-6*CZ/TR4 + 12*DZ/TR/TR4 - 20*EZ/TR3/TR3)*DB2
   43 F3T2 = -2*D*DB3/TR3
   44 F4T2 = 2*AL*D*DB3*DB3/TR3
   45 F5T2 = 6*C*DB3/TR4*(1+GA*DB2)*XP
   46 D2PDT2 = (1.8*1.8/PK)*(F2T2 + F3T2 + F4T2 + F5T2)
C    GET DP/DD, THEN CONVERT TO SI UNITS.
   51 F1D = GK*TR
   52 F2D = 2*F2/DB  $  F3D = 3*F3/DB  $  F4D = 6*F4/DB
   54 F5A = (C/TR2)*(3*DB2 + 5*GA*DB*DB3)
   55 F5D = -2*GA*DB*F5 + F5A*XP
   56 DPDD = (DK/PK)*(F1D + F2D + F3D + F4D + F5D)
C    ENTHALPY (H-HZ) VIA STARLING REPORT.
   62 H2 = (BZ*GK*TR - 2*AZ - 4*CZ/TR2 + 5*DZ/TR3 - 6*EZ/TR4)*DB
   63 H3 = (2*B*GK*TR - 3*A - 4*D/TR)*DB2/2
   64 H4 = (6*A + 7*D/TR)*AL*DB2*DB3/5
   65 H5 = (3 - (3 + GA*DB2/2 - GA*GA*DB*DB3)*XP)*C/GA/TR2
   66 H = (H2 + H3 + H4 + H5)*DK*100/PK
   99 RETURN   $   END
```

```
      SUBROUTINE STARTIT
C     COMPARE ISOBUTANE PROPERTIES WITH STARLING ON ISOTHERMS.
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      COMMON/8/ IN,IK, P,T,DEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION TT(6), DX(6)
      DATA (TCRT = 408.0)
      DATA(TT = 200.0, 300.0, 400.0, 410.0, 450.0, 500.0)
      DATA(DX = 0.02, 0.04, 0.16, 0.16, 0.16, 0.16)
    1 FORMAT(1H1 2X*ISOBUTANE, R.D.G. VS. K.E.S. AT T =*F7.2,* DEG. K*/
    1 3X *UNITS KELVINS, BARS, G-MOL/LITER, JOULES. * /
    1 3X *DATA = R.D.G.,   CALC. = K.E.S. * //
    1 3X5HMOL/L 3X5HP,BAR 4X4HCALC 3X4HPCNT
    2          3X5HDP/DD 4X4HCALC 3X4HPCNT
    3          3X5HDP/DT 4X4HCALC 3X4HPCNT
    4          2X7HD2P/DT2 5X4HCALC
    5          5X4HH-HZ 5X4HCALC 3X4HPCNT )
    2 FORMAT(2XF6.3, 2F8.2, F7.2, 2F8.2, F7.2, 2F8.3, F7.2,
    1 2F9.5, 2I9, F7.2)
    5 FORMAT(1X)
C     PRINT SIX COMPARISON ISOTHERMS. OMIT COEXIST.
   10 DO 99 I=1,6  $ L = 0  $ T = TT(I)  $ DS = DX(I)
   11 PRINT 1, T  $ PM = PMELTF(T)  $ IF(T-TCRT) 12,12,15
   12 DG = DENGASF(T)  $ DL = DENLIQF(T)
   15 DO 90 J=1,900  $ DN = J*DS  $ IF(T-TCRT) 16,16,20
   16 IF(DN.GE.DG.AND.DN.LE.DL) 17,20
   17 L = L + 1  $ IF(L.EQ.1) 18,90
   18 PRINT 5  $ GO TO 90
   20 PGOD = P = PVTF(T,DN,1)  $ IF(P.GT.PM.OR.P.GT.400) 99,21
   21 DPDDG=DPDD  $ DPDTG=DPDT  $ D2PDT2G=D2PDT2
   22 IF(DN.LT.DG.(R.T.GT.TCRT) 23,24
   23 CALL GENEOUS  $ GO TO 25
   24 CALL COMPRLQ  $ TI = T  $ CALL IDEAL
   25 HGOD = H - EZZ - HZ
   30 DEN = DN  $ CALL STAREQN  $ PSTR = P  $ DPDDS=DPDD
   31 DPDTS=DPDT  $ D2PDT2S=D2PDT2  $ HSTR = H
   35 PCTP = 100*(PSTR/PGOD-1)
   36 PCTD = 100*(DPDDS/DPDDG-1)
   37 PCTT = 100*(DPDTS/DPDTG-1)
   39 PCTH = 100*(HSTR/HGOD-1)
   40 IHG = HGOD  $ IHS = HSTR
   50 PRINT 2, DEN, PGOD,PSTR,PCTP, DPDDG,DPDDS,PCTD, DPDTG,DPDTS,PCTT,
    1 D2PDT2G, D2PDT2S, IHG, IHS, PCTH
   90 CONTINUE
   99 CONTINUE   $  RETURN  $  END
```

```
      SUBROUTINE TABLIQ
C     TABULATE THE I-BUTANE SATURATED LIQUID FUNCTIONS.
      COMMON/1/AL,BE,GA,OE,EP, DCRT,TCRT,PCRT, OGAT,OTRP,TTRP,PTRP
      COMMON/3/OPOT,O2POT2,OPSOT,OPMCT,OPDO,DPOR,OTSDR,OTHDR
      COMMON/5/ OOSOT
      COMMON/6/ TSAT, THETA, PSAT
      COMMON/8/ IN,IK, P,T,OEN, E,H,S, CV,CP,CSAT, W,WK
      COMMON/9/ONG,EG,HG,SG, CVG,CPG,WG, OPGO ,OPGDO
      DIMENSION TSA(65), PSA(65)
    4 FORMAT(1H1 13X *PROPERTIES OF SATURATED LIQUID I-BUTANE* //
    1 14X1HT 10X1HP 5X3HDEN 3X5HV,LIQ 6X5HV,GAS 5)6HOPS/OT 3X6HOOL/OT
    2 4X5HDP/OT 6X5HDP/DD 2X5HQ,VAP /
    3 10X 5HOEG K 8X3HBAR 3X5HMOL/L 3X5HL/MOL 6X5HL/MOL 6X5HBAR/K
    4 2X7HMOL/L/K 4X5HBAR/K 2X9HBAR-L/MOL 2X5HJ/MOL )
    5 FORMAT(5XF10.3, E11.4, F8.3, F8.5, 2E11.4, F9.5, F9.3, E11.4, I7)
   11 FORMAT(1H1 13X *PROPERTIES OF SATURATED LIQUID I-BUTANE* //
    1 14X1HT 11X1HP 9X1HE 9X1HH 9X1HS
    2 6X2HCV 6X 2HCS 6X2HCP 6X1HW /
    3 10X5HOEG K 9X3HBAR 5X5HJ/MOL 5X5HJ/MOL 3X7HJ/MOL/K
    4 1X7HJ/MOL/K 1X7HJ/MOL/K 1X7HJ/MOL/K 2X5HM/SEC )
   12 FORMAT(5X F10.3, E12.4, 2F10.1, F10.3, 3F8.2, I7)
C     FOR PAGE ONE OF TABLIQ.
C     REPLACE T = 260 BY BOILING-POINT AT J = 31.
  130 PRINT 4    $    NP = 31
  131 DO 150 J=1,NP  $  IF(J.EQ.1) 132,133
  132 T = TTRP  $  GO TO 139
  133 IF(J.EQ.16) 134,135
  134 T = FINDTSF(1.01325)   $  GO TO 139
  135 IF(J.EQ.NP) 136,138
  136 T = TCRT   $  OG = OL = OCRT   $  DOLOT = 0
  137 VG = VL = 1.0/DCRT  $  GO TO 141
  138 T = 100 + 10*J
  139 OL = OENLIQF(T)   $  OOLDT = DDSOT
  140 OG = OENGASF(T)   $  VG = 1/DG   $  VL = 1/OL
  141 TSA(J) = T   $  PX = PVTF(T,DL,1)
  147 PSA(J) = PS = PSAT   $  IQX = QX = QVAPXF(T)   $  OQ = QX - IQX
  148 IF(DQ.GT.0.4999)  IQX = IQX + 1
  150 PRINT 5, T,PS,OL,VL,VG, DPSOT,OOLDT, DPOT,OPOO, IQX
C     FOR PAGE TWO OF TABLIQ.
C     USE COEXIST AT ALL TEMPS.
  160 PRINT 11   $  DO 170 J=1,NP  $  P = PSA(J)  $  T = TSA(J)
  164 CALL COEXIST  $  IW = W
  170 PRINT 12, T,P, E,H,S, CV,CSAT,CP, IW
  999 RETURN     $     END
```

```
      FUNCTION THETAF(DEN)
C    THETA = TSAT*EXP(U(S)).
C    LET Q = (S-1)/(ST-1),  WHERE ST = DTRP/DCRT,  THEN -
C    IF S < 1, U = AL*Q**3,    IF S > 1,  U = -AL*Q**3,
      COMMCN/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMCT,DPDD,DPCR,DTSDR,DTHDR
      COMMON/6/ TSAT, THETA, PSAT
    1 S = DEN/DCRT   $  DSDR = DTRP/DCRT   $  C = DSDR-1
    2 Q = (S-1)/C   $   Q2 = Q*Q   $   U = AL*Q*Q2
    3 U1 = AL*3*Q2*DSDR/C    $    IF(Q) 5,9,4
    4 U = -U    $    U1 = -U1
    5 XP = EXP(U)     $    THETAF = TSAT*XP
    6 DTHDR = (TSAT*U1 + DTSDR)*XP    $    RETURN
    9 THETAF = TCRT   $   DTHDR = 0    $    RETURN   $   END




      FUNCTION TSATF(DEN)
C    ITERATE T TO MINIMIZE (DEN-DCALC) VIA DENGASF(T), DENLIQF(T).
      COMMCN/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMOT,DPDD,DPCR,DTSDR,DTHDR
      COMMCN/5/ DDSDT
      CATA (Q=2.0),(FN=6.3890561)
C    NOTE,   FN = EXP(Q) - 1.0.
    1 FORMAT(1H0 9X *TSATF FAILS TO CONVERGE. * / )
    2 D=DEN $ S=D/DCRT $ YN=TCRT/TTRP-1   $  IF(DEN-DCRT) 3,30,4
    3 ST=DGAT/DCRT $ F=ALOG(S)/ALOG(ST)*((1-S)/(1-ST))**2   $  GO TO 5
    4 ST=DTRP/DCRT $ U=((S-1)/(ST-1))**3 $ F=(EXP(Q*U)-1)/FN
    5 T = TCRT/(1 + YN*F)
    6 DO 15 J=1,50   $  IF(DEN-DCRT) 7,30,8
    7 DD = D - DENGASF(T)    $   GO TO 9
    8 DD = D - DENLIQF(T)
    9 IF(ABS(DD/D).LT.1.0E-7) 16,10
   10 DT = DD/DDSDT    $    IF(ABS(DT/T).LT.1.0E-7) 16,11
   11 T = T + DT    $    IF(T) 12,12,13
   12 T = TTRP    $   GO TO 15
   13 IF(T.LT.TCRT) 15,14
   14 T = TCRT - 0.10
   15 CONTINUE    $    PRINT 1    $    STOP
   16 TSATF = T   $    DTSDR = DTRP/DDSDT    $    RETURN
   30 TSATF = TCRT    $    DTSDR = 0    $    RETURN  $  END
```

```
      FUNCTION XBF(T,D)
C    XBF = SQRT(T/TC)*LN(T/TS) = Q(T)*Z(R,T),
     COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
     COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
     COMMON/4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
     COMMON/6/ TSAT, THETA, PSAT
   1 TC = TCRT   $  TS = TSAT   $   X = T/TC
   2 U = T/TS   $   U1X = TC/TS   $   U1R = -U*DTSDR/TS
   3 Z = ALOG(U)   $   Z1R=U1R/U   $   Z1X=U1X/U   $   Z2X=-Z1X*Z1X
   4 Q = SQRT(X)    $   Q1 = 0.5/Q   $   Q2 = -Q1/2/X
   5 XBF = Q*Z   $   DXBDR = Q*Z1R   $   XB1 = Q*Z1X + Q1*Z
   6 XB2 = Q*Z2X + Q1*2*Z1X + Q2*Z    $    RETURN   $   END
```

```
      FUNCTION XEF(T,D)
C    XEF ≡ PSI - PSISAT,  PSI ≡ A*F(T) + B*H(R,T),  W ≡ (1-TH/T),   AND -
C    F(T) ≡ EXP(C*(1-X)),    H(R,T) ≡ (1 - W + W*LN(W)).
     COMMON/1/AL,BE,GA,DE,EP, DCRT,TCRT,PCRT, DGAT,DTRP,TTRP,PTRP
     COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
     COMMON/4/XB1,XB2, XC1,XC2, XE1,XE2, DXBDR,DXCDR,DXEDR
     COMMON/6/ TSAT, THETA, PSAT
   1 A=DE $ B=1-A $ C=EP $ TC=TCRT $ TS=TSAT $ TH=THETA
   2 X = T/TC   $   XS = TS/TC   $   XS1 = DTSDR/TC
   3 W = 1.0 - TH/T   $   IF(W) 30,30,4
   4 F = EXP(C*(1-X))   $   F1 = -C*F   $   F2 = -C*F1
   5 W1R = -DTHDR/T   $   W1X = TH/T/X   $   W2X = -2*W1X/X
   6 G = ALOG(W)   $   H = W*G - W + 1   $   H1R = G*W1R
   7 H1X = G*W1X   $   H2X = G*W2X + W1X*W1X/W
  10 P = A*F + B*H   $   P1R = B*H1R
  11 XE1 = A*F1 + B*H1X   $   XE2 = A*F2 + B*H2X
  15 WS = 1.0 - TH/TS   $   IF(WS) 16,16,17
  16 FS = HS = 1   $   FS1 = HS1 = 0   $   GO TO 21
  17 WS1 = (TH*DTSDR/TS - DTHDR)/TS   $   GS = ALOG(WS)
  18 HS = WS*GS - WS + 1   $   HS1 = GS*WS1
  20 FS = EXP(C*(1-XS))   $   FS1 = -C*XS1*FS
  21 PS = A*FS + B*HS   $   PS1 = A*FS1 + B*HS1
  25 XEF = P - PS   $   DXEDR = P1R - PS1    $    RETURN
  30 XEF = XE1 = XE2 = DXEDR = 0   $    RETURN   $   END
```

182

```
      PROGRAM ZIEGLER(OUTPUT)
C     PROGRAM ZIEGLER(OUTPUT,PUNCH)
C   I-BUTANE, ESTIM. V.P. AND QVAP FROM TRIPLE- TO BOILING-POINTS,
C   USING ENTHALPY AND ENTROPY CLOSED LOOPS.
      COMMON/1/ TA,TB,PB,QB, OELH,OELS
      COMMON/2/ EZA,HZA,SZA, HGB,SGB, OHLAB,OSLAB
      COMMON/3/OPDT,D2PDT2,DPSDT,DPMDT,OPOD,OPOR,DTSDR,OTHOR
      COMMON/9/ PZIP, BZ, OBZOT, DPZDT, DZOO
      COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      DIMENSION QK(2),TK(150),OK(150),PIK(150),PK(150),QJ(150)
    1 FORMAT(I5, F10.3, E15.6)
    2 FORMAT(I5, F10.3, F10.0)
    3 FORMAT(1H1 11X *I-BUTANE ESTIM. V.P.,BAR, AND QVAP, KJ/MOL. * //
     1 12X 4HTB =F10.5, 6H, PB =F8.5, 6H, DB =F9.6/
     2 12X5HEZB =F7.1, 7H, EGB =F7.1, 7H, HZB =F8.1, 7H, HGB =F8.1/
     3 12X 5HSZB =F9.4, 7H, SGB =F9.4, 6H, Q8 =F8.1/ )
    4 FORMAT(7X 3HT,K 8X2HPI 6X5HP,BAR 5X5HMOL/L 6X3HHZA 6X3HHGA
     1 6X3HSZA 6X3HSGA 4X5HDHGAB 4X5HOHLAB 4X5HOSGAB 4X5HDSLAB
     2 5X3HQAH 5X3HQAS )
    5 FORMAT(2XF8.2, E10.4,E11.5,E10.4, 2F9.1,2F9.3, 2F9.1,2F9.3, 2F8.3)
    6 FORMAT(12X 3HT,K 4X5H100/T 7X5HP,EQN 7X5HP,BAR 6X5HLN(P)
     1 7X5HMOL/L 3X5HQ,EQN 3X5HQ,VAP )
    7 FORMAT(5X F10.2, F9.5, 2E12.5, F11.5, E12.5, 2F8.3)
    8 TTRP = 113.55  $  PB = 1.01325  $  TB = 261.4
C   ISOBUTANE QVAP,J/MOL VIA ASTON(1940) AT BP, 261.44 K.
    9 QK(1) = QK(2) = 21297.0
C   GET HGB, SGB FOR SATVAPOR AT THE BOILING POINT.
   10 TI = TB  $  CALL IDEAL  $  EZB=EZ  $  HZB=HZ  $  SZB=SZ
   11 DNB = FINDENF(TB,PB)  $  EGB = EZ + EDELF(TB,DNB)
   12 SGB = SZ + OELS  $  HGB = EGB + 100*PB/DNB
   14 I = 1  $  QB = QK(I)
   15 PRINT 3, TB,PB,DNB, EZB,EGB, HZB,HGB, SZB,SGB, QB  $  PRINT 4
C   DO TEMPERATURES FROM TRIPLE- TO BOILING-POINTS -
   20 DO 50 J=1,149  $  IF(J.EQ.1) 21,22
   21 TA = T = TTRP  $  GO TO 23
   22 TA = T = 112 + J
C   GET EZA, HZA, SZA AT T = TA.
   23 TI = TA  $  CALL IDEAL  $  EZA=EZ  $  HZA=HZ  $  SZA=SZ
C   GET OHLAB, OSLAB FOR THE SATDLIQUID FROM TA TO TB.
   24 CALL CSATSUM  $  OHLAB = DELH  $  OSLAB = OELS
C   NOW ITERATE P (T=TA) TO MINIMIZE (QAH - QAS).
   30 P = PI = PSATF(T)  $  DP = P/2  $  SS = OELTAF(T,P)
   31 DO 40 IT=1,15  $  PL = P-DP  $  SL = DELTAF(T,PL)
   32 PP = P+OP  $  SP = OELTAF(T,PP)
   35 IF(SL-SS) 36,36,38
   36 IF(SL-SP) 37,37,39
   37 SS = SL  $  P = P - OP  $  GO TO 40
   38 IF(SP-SS) 39,40,40
   39 SS = SP  $  P = P + OP
   40 OP = OP/2  $  ONA = FINDENF(T,P)
C   USE FINAL P TO GET DNA, HGA,SGA, OHGAB,OSGAB,
C   AND THEN, VIA LOOP, GET QAH, QAS.
   42 EGA = EZA + EOELF(T,ONA)  $  SGA = SZA + OELS
   43 HGA = EGA + 100*P/DNA  $  DHGAB=HGB-HGA  $  OSGAB=SGB-SGA
   44 QAH = QB + OHLAB - OHGAB  $  QAS = TA*(QB/TB + OSLAB - OSGAB)
   45 QAH = QAH/1000  $  QAS = QAS/1000  $  PIK(J) = PI
   46 TK(J)=TA  $  OK(J)=ONA  $  PK(J)=P  $  QJ(J) = (QAH+QAS)/2
   50 PRINT 5, TA,PI,P,ONA, HZA,HGA, SZA,SGA, OHGAB,OHLAB,
```

```
      1 DSGAB, DSLAB, QAH,QAS
C       PRINT T,1/T, FEQN,P,LN(P), DNA, QEQN,Q,  FOR PUBLICATION.
     61 PRINT 3, TB,PB,DNB, EZB,EGB, HZB,HGB, SZB,SGB, QB  $  PRINT 6
     62 DO 99 J=1,149
C    63 IF(J.EQ.50.OR.J.EQ.99) 67,70
C    67 PRINT 3, TB,PB,DNB, EZB,EGB,HZB,HGB,SZB,SGB, QB  $  PRINT 6
     70 T = TK(J)  $  AT = 100/T  $  P = PK(J)  $  GP = ALOG(P)
     71 QE = QVAPXF(T)/1000
C    75 PRINT 7, T,AT, PIK(J),P,GP, DK(J), QE,QJ(J)
     80 IDX = 40  $  IF(J.EQ.1) 90,81
     81 IT = T/5  $   IF(T-5*IT) 99,90
     90 QCALC = 1000*QJ(J)
     91 PRINT 7, T,AT, PIK(J),P,GP, DK(J), QE,QJ(J)
C    92 PUNCH 1, IDX,T,P  $  PUNCH 1, IDX,T,DK(J)  $  PUNCH 2, IDX,T,QCALC
     99 CONTINUE  $   STOP   $   END



       SUBROUTINE CSATSUM
C     GET DELH, DELS ALONG SATOLIQ FROM TA TO TB.
       COMMON/1/ TA,TB,PB,QB, DELH,DELS
       COMMON/3/DPDT,D2PDT2,DPSDT,DPHDT,DPDD,DPDR,DTSDR,DTHDR
      1 E = H = S = 0
      2 TR = TB - TA  $  N = ABS(TR)/2 + 2  $  DT = TR/N
      3 DO 8 J=1,N  $  TJ = TA + (J-0.5)*DT
      4 CS = CSATXF(TJ)  $  PS = PSATF(TJ)  $  DS = DENLIQF(TJ)
      5 H = H + CS*DT + 100*DPSDT*DT/DS  $  S = S + CS*DT/TJ
      8 CONTINUE
      9 DELH = H  $  DELS = S  $   RETURN $ END



       FUNCTION CSATXF(T)
C     I-BUTANE CSAT TO B.P. VIA ASTON (1940).
C     VIA PROGRAM CSATFIT, 9/20/78 AT 12.27.
C     CS(T) = A + B*X2 + C*X3 + D*X4,  X ≡ (T-TZ)/300.
       DATA (TZ = 95.0)
       DATA (A=98.5087),(B=298.6533),(C=-700.4833),(D=653.0975)
      1 FORMAT(1H0 9X *T EXCEEDS 265 IN CSATXF(T). * / )
      2 IF(T.GT.265) 3,4
      3 PRINT 1  $   STOP
      4 X = (T-TZ)/300  $   X2 = X*X
      5 CSATXF = A + B*X2 + C*X*X2 + D*X2*X2  $   RETURN  $  END



       FUNCTION DELTAF(T,P)
C     GET DNA,EGA,HGA,SGA FOR SATOVAPOR AT T,P, (T=TA),
C     GET DHGAB ≡ HGB-HGA,  DSGAB ≡ SGB-SGA,
C     GET QAH, QAS VIA CLOSED LOOPS, THEN, DELTAF ≡ ABS(QAH-QAS).
       COMMON/1/ TA,TB,PB,QB, DELH,DELS
       COMMON/2/ EZA,HZA,SZA, HGB,SGB, DHLAB,DSLAB
       COMMON/99/ TI,EZZ, EZ,SZ,CVZ, HZ,CPZ
      1 IF(P.GT.0) 2,9
      2 DNA = FINDENF(T,P)  $  EGA = EZA + EDELF(T,DNA)
      3 SGA = SZA + DELS  $  HGA = EGA + 100*P/DNA
      5 DHGAB = HGB - HGA  $  DSGAB = SGB - SGA
      6 QAH = QB + DHLAB - DHGAB  $  QAS = T*(QB/TB + DSLAB - DSGAB)
      8 DELTAF = ABS(QAH-QAS)  $   RETURN
      9 DELTAF = 1.0E+100  $   RETURN  $  END
```

```
      FUNCTION EDELF(T,D)
C     CHANGE OF E,S ON ISOTHERM T FROM DEN = 0 TO DEN = D.
C     USE VIRIAL EQNSTATE.  NOTE DCZ = 3.8 MOL/L.
C     DELE = EDELF = -R*(D/DCZ)*T*T*DB(T)/DT,
C     DELS = -R*LN(D*R*T/P1) - R*(D/DCZ)*(B(T) + T*DB(T)/DT).
      COMMON/1/ TA,TB,PB,QB, DELH,DELS
      COMMON/9/ PZIP, BZ, DBZDT, DPZDT, DZDD
      DATA (Q=1.01325),(R=0.0831450),(DCZ=3.80)
    1 Z = ZIPF(T,D)   $  EDELF = -100*R*(D/DCZ)*T*T*DBZDT
    2 DELS = ALOG(D*R*T/Q) + (D/DCZ)*(BZ + T*DBZDT)
    9 DELS = -100*R*DELS   $    RETURN  $  END




      FUNCTION FINDENF(T,P)
C     GIVEN P,T IN VIRIAL EQN., SOLVE QUADRATIC FOR DEN, MOL/L.
      DATA (DCRT=3.80),(TCRT=408.13),(R=0.083145)
      DATA (B1=0.50084721),(B2=-1.10039322),(B3=-0.64781233)
    1 X = T/TCRT   $  B = B1 + B2/X + B3/X/X/X
    2 Q = SQRT(1.0 + 4*P*B/R/T/DCRT)
    3 FINDENF = DCRT*(Q-1)/2/B     $   RETURN  $   END




      FUNCTION PSATF(T)
C     I-BUTANE VAPOR PRESSURE, BAR.   R.D.G., (SEPT, 1978).
C     LN(P) = A + B*U + C*X + D*X2 + E*X3 + F*X*(1-X)**EPP.
C     WHERE,   X = T/TCRT,   U = (1-1/X).
      COMMON/3/DPDT,D2PDT2,DPSDT,DPMDT,DPDD,DPDR,DTSDR,DTHDR
      DATA(EPP=1.30),(TCRT=408.10),(A=7.70053220),(B=8.13664265),
    1 (C=-6.73486177),(D=2.13857039),(E=0.49469225),(F=1.13184170)
    1 FORMAT(1H0 9X *T ABOVE TCRT IN PSATF(T). * / )
    2 X = T/TCRT   $  X2 = X*X  $  X1T = 1.0/TCRT
    3 U = 1.0 - 1/X  $  U1T = 1.0/X/T
    4 V = 1.0 - X  $  IF(V) 7,8,9
    7 PRINT 1   $   STOP
    8 Z = Z1 = 0  $  GO TO 10
    9 Z = V**EPP  $  Z1 = -EPP*Z/V
   10 CONTINUE
   12 PL = A + B*U + C*X + D*X2 + E*X*X2 + F*X*Z
   13 PL1T = B*U1T + (C + 2*D*X + 3*E*X2 + F*(X*Z1 + Z))*X1T
   15 PSATF = EXP(PL)  $  DPSDT = PL1T*PSATF   $   RETURN  $  END




      FUNCTION ZIPF(T,D)
C     ISOBUTANE VIRIAL EQN., R.D.G., SEPT., 1978.
C     Z(T,D) = 1 + B(X)*S,   X = T/TCRT,   S = DEN/DCRT.
C     B(X) = B1 + B2/X + B3/X3.   DEN IN MOL/L.
      COMMON/9/ PZIP, BZ, DBZDT, DPZDT, DZDD
      DATA (DCRT=3.80),(TCRT=408.13),(R=0.083145)
      DATA (B1=0.50084721),(B2=-1.10039322),(B3=-0.64781233)
    1 S = D/DCRT   $  X = T/TCRT  $  X2 = X*X  $  X3 = X*X2
    2 BZ = B = B1 + B2/X + B3/X3
    3 ZIPF = 1.0 + B*S  $  PZIP = D*R*T*ZIPF
    4 DBZDT = -(B2/X2 + 3*B3/X/X3)/TCRT  $  DZDD = B/DCRT
    5 DPZDT = D*R*(S*T*DBZDT + ZIPF)   $   RETURN  $  END
```
185

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBSIR 79-1612	2.Gov't. Accession No.	3. Recipient's Accession No.

4. TITLE AND SUBTITLE	5. Publication Date
ISOBUTANE: PROVISIONAL THERMODYNAMIC FUNCTIONS FROM 114 to 700 K AT PRESSURES TO 700 BAR	July 1979
	6. Performing Organization Code

7. AUTHOR(S) Robert D. Goodwin	8. Performing Organ. Report No.

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. Project/Task/Work Unit No.
NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, DC 20234	11. Contract/Grant No.

12. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS (Street, City, State, ZIP)	13. Type of Report & Period Covered
Gas Research Institute 10 West 35th Street Chicago, Illinois 60616	14. Sponsoring Agency Code

15. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

16. ABSTRACT (*A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.*)

Thermophysical properties of isobutane are tabulated at integral temperatures along isobars over the entire range of fluid states. Results for the compressed liquid, from the triple- to the boiling-point, have been estimated by use of the highly constrained, nonanalytic equation of state, because experimental P-ρ-T data are lacking in this region.

17. KEY WORDS (*six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons*) Densities; enthalpies; entropies; equation of state; internal energies; isobars; isobutane; isochores; isotherms; Joule-Thomson inversion; latent heats of vaporization; melting line; orthobaric densities; specific heats; speeds of sound; vapor pressures.

18. AVAILABILITY	XX Unlimited	19. SECURITY CLASS (THIS REPORT)	21. NO. OF PRINTED PAGES
☐ For Official Distribution. Do Not Release to NTIS		UNCLASSIFIED	191
☐ Order From Sup. of Doc., U.S. Government Printing Office, Washington, DC 20402, SD Stock No. SN003-003-		20. SECURITY CLASS (THIS PAGE)	22. Price
XX Order From National Technical Information Service (NTIS), Springfield, VA. 22161		UNCLASSIFIED	$8.00

USCOMM-DC